CC130 Aircraft Technician Mission, Function, Task Analysis
Draft Report

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For:
Brad Cain

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Abstract

This report documents the conduct and associated results of a Mission, Function, Task Analysis (MFTA) for the CC130 Hercules aircraft technician. The MFTA was conducted in order to assess operator performance in extreme environmental conditions, and specifically focused on the impact of high temperature environments on error rates. To categorize maintainer tasks, a literature review of existing maintenance documentation was performed. Additional research was conducted to assess the existing occupational, safety and health guidelines for operations in high temperature environments. A function and task analysis was then conducted with CC130 Subject Matter Experts to populate a task database with timing and workload data. The results of the MFTA indicate that while no formal procedures exist for operations within extreme climactic conditions, the maintenance community has developed a set of informal guidelines to minimize the impact of thermal strain on operator error. Additional effort should also be conducted to determine the impact of NBCD conditions on operator performance by integrated the task data from the current analysis within human performance modelling techniques.

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Executive Summary

This report documents the work completed by Greenley & Associates Incorporated under PWGSC File Number W7711-04918/A, CC130 Aircraft Technician Mission, Function, Task Analysis. As part of this effort, a Mission, Function, Task Analysis (MFTA) was conducted to characterize CC130 Aircraft Technicians' work duties, operational environment and the psychological and physiological task demands made on the operator.

An initial literature review was conducted to gain an understanding of the Operational Scenario of the CC130 Aircraft, existing guidelines for heat stress limits, and the current state of knowledge on the impacts of heat stress on cognition. The literature review included industrial, civil and military standards for heat stress as well as maintenance documentation.

The literature review was followed by a preliminary analysis consisting of a review of the missions, functions and goals identified during an initial Subject Matter Expert (SME) session conducted at CFB Trenton with CC130 maintenance staff. The results of this analysis were further refined on a subsequent SME session to verify the results of the MFTA.

The results of the mission analysis provided coverage of broad functional activities, including regular maintenance procedures in addition to conditional maintenance activities. The functional activities were then grouped by the regular inspection periods associated with pre- and post-flight maintenance, periodic inspections, and specific maintenance functions associated with repairs. This approach allowed for the assessment of a subset of functions that represent the full spectrum of maintenance duties performed by technicians.

System functions were further decomposed into their supporting tasks and activities. Where possible, operator workload and timing data were captured to assist in the development of Task Network Models using the IPME environment.

The results of the analysis indicate a current lack of standardized approaches to the management of high temperature operating environments on operator performance within the Canadian Forces. Additional effort needs to be conducted in order to provide standardized procedures for deployed operations within extreme environmental conditions. In addition, the impact of NBCD protective clothing on operator performance is not well understood, and further research should be conducted to leverage human performance modelling capabilities in this area.

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Table of Contents

Abstract i

Executive Summary iii

Table of Contents vi

List of Figures viii

List of Tables viii

Acknowledgements ix

1.1 Background 1
1.2 Purpose 1
1.3 Scope 1
1.4 Document Outline 1

2 Method 3
2.1 Overview 3
2.2 Mission Analysis 3
2.3 Function Analysis 4
2.3.1 Function Flow Diagrams and Tables 4
2.3.2 Function Allocation 4
2.4 Task Analysis 4

3 Results 6
3.1 Mission Analysis 6
3.1.1 CC130 Maintenance Technicians 6
3.1.1.1 Aviation Systems Technicians (AVN TECHs) 7
3.1.1.2 Avionics Systems Technicians (AVS TECHs) 7
3.1.1.3 Aircraft Structure Technicians (ACS TECHs) 8
3.1.2 CC130 Deployment 8
3.1.2.1 Maintenance Crew Composition 8
3.1.2.2 Operating Environment 8
3.1.2.3 Typical Mission Duration 9
3.1.3 Impact of Heat Exposure 9
3.1.3.1 Civilian Heat Exposure Guidelines 9
3.1.3.2 Military Heat Exposure Guidelines 10
3.1.4 Control Measures 10
3.1.4.1 CCOHS Recommended Control Measures 10
3.1.4.2 Engineering Controls 10
3.1.4.3 Personal Protection 11
3.1.5 Current CC130 Technician' SOPs for Risk Reduction 11
3.1.5.1 Engineering Controls 12
3.1.5.2 Personal Protection 12
3.1.5.3 Administrative Controls 13
3.1.5.4 Nuclear, Biological, Chemical (NBC) Environments 13
3.1.6 Mission Scenario 14

3.1.6.1 Scenario Overview 14
3.1.6.2 Assumptions 14
3.1.6.3 Chronological Sequence of Mission Events 14
3.2 Function Analysis 15
3.2.1 CC 130 Maintenance Activities 16
3.2.1.1 Pre- and Post Flight Checks 16
3.2.1.1.1 B Check 16
3.2.1.1.2 A Check 17
3.2.1.1.3 A-B Check 17
3.2.1.2 Supplementary Check 17
3.2.1.3 Primary Inspection 17
3.2.1.4 Conditional Inspection 17
3.2.2 Maintenance Errors 18
3.2.2.1 Publications 18
3.2.2.2 Selection of Crews 18
3.2.2.3 Task Verification 18
3.2.2.4 Error Rates and Operator Performance 19
3.3 Task Analysis 19
3.3.1 B Checks 21
3.3.2 A Check 22
3.3.3 Conditional Inspection Operation in Sand, Dust or High Ambient Temp (CON 19) 22
3.3.4 Conditional Inspection Engine Overtorque (CON 20) Condition 2 22
3.3.5 Conditional Inspection Cargo and Door and Ramp Overspeed (CON 26) 22

4 Discussion 24
4.1 Operator Errors 24
4.2 Health and Safety Standards 24
4.3 Operations in NBCD Conditions 24

5 Conclusion 25

References 26

Annex A - Mission Flow Diagram 27

Annex B – Function / Task Flow Diagrams 29

Annex C – Function / Task Tables 53

Annex D – VACP Components 102

Annex E - Photo-Documentation 103

Glossary 121

Distribution List 122

Document Control Data Sheet (DCD) 123

List of Figures

Figure 1. AVNs Opening Left Landing-Gear Compartment to Prepare for Visual Inspection 22
Figure 2. External view of Platypus access to rudder torque arms and elevator hinge points 23

List of Tables

Table 1. MOC Sub-Categories by MOC 6
Table 2. Screening Criteria for Heat Stress Exposure (WBGT values in °C) for 8 hour work days per week with conventional breaks 9
Table 3. Correction of Threshold Limit Values for Clothing 10
Table 4. Summary of Control Measures 11
Table 5. Scenario Assumptions 14
Table 6. Work Intensity Ratings 20

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1 Introduction

This report documents the work completed by Greenley & Associates Incorporated under PWGSC File Number W7711-04918/A, CC130 Aircraft Technician Mission, Function, Task Analysis.

1.1 Background

The Canadian Forces are increasingly being deployed to operations in hot environments (NATO A1 climates) and although there are guidelines for work-rest cycles to maintain physical performance [1], complementary guidelines do not exist that seek to maintain cognitive performance.

To determine appropriate work-rest cycles for aircraft technicians working in hot environments, a dynamic assessment of operator state, coupled with performance criteria relating limits on operator state to acceptable error or accuracy rates is required. One method of accomplishing this assessment is through the simulation of operator activity that uses a model of operator tasks within the environment that those tasks occur, and extrapolating from performance in temperate climates such as southern Ontario to hotter parts of the world. In order to develop a representative model of operator performance, an assessment of aircraft technician operating environments, functions and tasks is required.

1.2 Purpose

As part of this effort, a Mission, Function, Task Analysis (MFTA) was conducted to characterize CC130 Aircraft Technicians' work duties, operational environment and the psychological and physiological task demands made on the operator.

The MFTA process developed a mission analysis to describe the overall system boundaries for the CC130 operator in an extreme environment. Following this, the functions performed by the system to achieve its mission objectives were identified and described. These functions were further decomposed to define specific tasks (tasks and sub-tasks) that must be performed to accomplish the functions. The goal of the current MFTA is to assess the physical and mental workload demands of CC130 Maintenance Technicians for functional maintenance activities, and to collect the appropriate data to provide the framework for models to be built using the Integrated Performance Modelling Environment (IPME).

1.3 Scope

The scope of this report is to:

i. Describe the method used during the MFTA;

ii. Present results of the MFTA; and

iii. Discuss results and implications of the MFTA.

1.4 Document Outline

This document outlines the Mission, Function, Task Analysis conducted for CF CC130 Aircraft Technicians' duties during a typical operational deployment.

This report contains the following sections:

i. Introduction;

ii. Method;

iii. Results;

iv. Discussion; and

v. Conclusion.

2 Method

This section describes the method used to conduct the MFTA. Summarized are descriptions of the goals and expected data elements of the MFTA.

2.1 Overview

The MFTA was performed as an iterative process that was developed over a series of analyses conducted by the Human Factors team. Initially, a literature review was conducted to gain an understanding of the Operational Scenario of the CC130 Aircraft, existing guidelines for heat stress limits, and the current state of knowledge on the impacts of heat stress on operator performance. Industrial, civil and military standards for heat stress as well as Canadian Forces maintenance documentation were reviewed.

Two major iterations were conducted during the analysis. The initial analysis consisted of a review of the missions, functions and goals identified during an initial Subject Matter Expert (SME) session conducted at CFB Trenton with CC130 maintenance staff. The results of this analysis were further refined on a subsequent SME session to finalize the results of the MFTA. These interviews were conducted across the various CC130 Maintenance Technicians' Military Occupational Specifications (MOSs), and the task analysis was conducted for all CC130 Maintenance Technicians' tasks associated with the identified functions.

2.2 Mission Analysis

A mission analysis was conducted describing the roles of the CF CC130 Aircraft Technicians within the context of a typical operational deployment. Specifically, the entire maintenance cycle was defined, functions performed during deployed operations were identified and a representative sample of these functions was integrated into a mission scenario. The scenario developed for the CC130 analysis provided coverage of broad functional activities, including regular maintenance procedures as well as conditional maintenance activities. The mission analysis was used to:

i. Determine CC130 maintainer characteristics, roles and responsibilities;

ii. Determine the typical operating environment for the CC130 within a deployed setting;

iii. Determine the impact of extreme climactic conditions (with a focus on thermal stress) on the performance of maintainer tasks with a specific emphasis on work-rest cycles, error rates and Standard Operating Procedures (SOPs) for reducing risk;

iv. Determine the availability of shelters on deployment that could be used to reduce the impact of environmental stress either while working or during rest, focusing on the availability of air conditioning, relief from solar loads, and availability of water. Also assess SME opinion whether technologies such as individual micro-climate cooling would be practical for the Maintenance Technician MOS; and

v. Develop a typical operational scenario for the CC130, including all pre- and post-flight maintenance duties conducted as part of the scenario.

The mission scenario provides a comprehensive level of detail describing the sequence of actions and events associated with the execution of a representative mission and provide the foundation upon which to build the functional and task analyses. An outline of the mission scenario is provided in Annex A.

2.3 Function Analysis

A hierarchical function analysis was conducted to define the CC130 maintenance technician's functional activities through a series of reviews conducted with Subject Matter Experts (SMEs) at CFB Trenton and a review of CC130 maintenance documentation. The decomposition of these functions was completed to a level that supports general classes of activities (e.g. assess windscreen status), and also grouped according to their conduct within the regular aircraft maintenance cycle. The frequency of occurrence of the maintenance functions was assessed within the context of the operational scenario.

The functional activities were grouped by the regular inspection periods associated with pre- and post-flight maintenance, periodic inspections, and specific maintenance functions associated with repairs. This approach allowed for the assessment of a subset of functions that represent the full spectrum of maintenance duties performed by technicians. For example, repair functions associated with Conditional Inspections provide a representative sample of heavy, physically demanding tasks by while regular inspections such as A, B and AB Checks represent light maintenance functions associated with visual inspections.

Note: Maintenance functions associated with air-to-air refuelling were not assessed as the SMEs interviewed at CFB Trenton were not experienced with this equipment.

The function analysis was used to:

i. Determine the regular maintenance cycles and inspection periods for the CC130 aircraft;

ii. Allocate technician MOSs to specific maintenance activities;

iii. Determine types of common errors experience by CC130 Maintenance Technicians, with an emphasis on omission and commission errors. Focus on where errors typically occur, and what are the most severe;

iv. Determine proportion of error rates with an emphasis on changes in those error rates due to climactic conditions;

v. Determine pre-departure and pre-arrival repair plans;

vi. Determine planning activities for regular and unscheduled repairs; and

vii. Determine high level timings for gross maintenance tasks (e.g., conduct an A check, replace an engine, repair avionics equipment).

2.3.1 Function Flow Diagrams and Tables

The hierarchical operator-function analysis was integrated within the Task Architect toolset to capture function and task data and to generate function flow diagrams. The function flow diagrams are presented in Annex B, while the function and task tables are provided in Annex C.

2.3.2 Function Allocation

A function allocation was conducted based upon current SOPs as outlined in the DND MOS job description documents and interviews with SMEs [2, 3 & 4]. The results of the function allocation have been integrated within the function and task tables provided in Annex C.

2.4 Task Analysis

System functions were further decomposed into their supporting tasks and activities. Sufficient detail was captured to ensure that physical and mental workload demands for the functional activities were established through the SME sessions. Where possible, operator workload and

timing data were captured to assist in the development of Task Network Models using the IPME environment. For the purposes of the current analysis, only Visual and Cognitive task performance were captured. Task information was then added to the overall task database. During the SME sessions, photographs and video of common maintenance duties were also captured to support the task definitions. The information collected for this portion of the analysis included the following items:

i. Define tasks to the level of mental activity;

ii. Define the associated equipment used for each task, particularly where reasoning, judgment and decision-making are required;

iii. Provide estimates of the frequency and duration of each of the representative tasks within the functional groupings; and

iv. Characterize task attributes such as mental demands, typical metabolic load and task completion times.

3 Results

This section contains the results of the analyses that have been completed. The detailed function and task flows with associated data tables are located within the Annexes of this document.

3.1 Mission Analysis

This section presents the CC130 Maintenance Technicians' mission analysis in the following sections:

i. CC130 Maintenance Technicians – details the characteristics, roles and responsibilities of CC130 maintenance technicians.

ii. CC130 Deployment – details the characteristics of a typical CC130 operational deployment in hot environments.

iii. Heat Exposure - details the perceived impact of heat stress on task performance, current guidelines and recommended control measures for the prevention of heat-stress illness, current control measures in place for CC130 maintainers, and SME opinion on other control measures such as micro-climate cooling vests.

iv. Mission Scenario – provides the basic structure of an example scenario that is intended to be representative of the full spectrum of activities that Maintenance Technicians encounter during deployment including all pre- and post-flight maintenance duties.

3.1.1 CC130 Maintenance Technicians

This section provides analysis of the CC130 Maintenance Technicians' roles and responsibilities. CC130 technicians form part of the regular forces with reserve force members holding administrative positions only. This is due to the cost associated with training CC130 maintainers It is not economical to train reserve forces as aircraft technicians.

CC130 Maintenance Technicians currently fall within three MOS categories: Aviation Systems Technicians, Avionics Systems Technicians, and Aircraft Structures Technicians. Previously, maintenance techs would specialize in a specific sub-category of their particular Military Occupational Structure (MOS). Recently, however, technician specializations were amalgamated in order to provide phased cross-training to technicians across all sub-categories of the MOS. For example, an AVN TECH may begin training on engine maintenance duties (AVN – Propulsion) and increase there skillsets to include airframe related training (AVN- Airframe). As such, cross-trained technicians are responsible for maintaining a wide-range of aircraft components and systems. The full list of previous sub-categories are provided in Table 1.

Table 1. *MOC Sub-Categories by MOC*

MOC Category	Previous Sub-Categories
ACS	Aircraft Structures Technician – Metal (M565B)
	Aircraft Structures Technician - Welder (M565C)
	Aircraft Structures Technician - Machinist (M565D)
	Aircraft Structures Technician – Protective Coating and Markings (M565E)
	Aircraft Structures Technician - Textile (M565F)

MOC Category	Previous Sub-Categories
	Aircraft Structures Technician – Composites (M565G)
AVN	Aviation Systems Technician – Aircraft Weapons (M514B) Aviation Systems Technician – Propulsion (M514C) Aviation Systems Technician – Airframe (M514D)
AVS	Avionics Systems Technician – Aircraft (M526B) Avionics Systems Technician – Lab (M526C)

The three MOSs are described in the sections below.

3.1.1.1 Aviation Systems Technicians (AVN TECHs)

The role of the AVN TECH is to perform aircraft servicing duties. AVN TECHS perform scheduled and unscheduled inspections and maintenance of gas turbine engines, engine control systems, propeller systems and auxiliary power units both on and off aircraft. AVN TECHS also perform scheduled and unscheduled inspections and maintenance of all airframe systems including aircraft oxygen systems, egress systems, survival equipment, hydraulic, pneumatic, environmental, domestic, undercarriage and flight control systems. AVN TECHS are also responsible for aircraft furnishings and structural components, maintenance of Aircrew Life Support Equipment (ALSE) and liquid/gaseous bulk storage facilities. These duties are performed both on aircraft and in a shop environment. AVN TECHs use a wide variety of common tools as well as special tools and equipment. AVN TECHs are required to operate vehicles and support equipment necessary to complete their assignments.

As AVN TECHs are required to work around operating aircraft with moving aircraft parts, high pressure hydraulics / pneumatics, electrical systems and systems which incorporate explosive devices, the consequences of error ranges from minor injury or damage to the loss of life or catastrophic damage to valuable equipment.

3.1.1.2 Avionics Systems Technicians (AVS TECHs)

The role of the AVS TECH is to provide the technical expertise necessary for successful air operations at fixed installations, and under field conditions during peace and times of emergency and war. The main functions of the AVS TECH are to perform aircraft servicing duties; perform aircraft scheduled and unscheduled maintenance inspections; maintain aircraft avionics equipment and systems; maintain specialized equipment; perform technical administration; and provide technical assistance as required both on aircraft and in an AVS lab environment. The AVS TECH is involved with the inspection and repair of equipment varying from simple mechanical devices to complex and costly high-tech avionics components. Duties are carried out utilizing a wide variety of specialized tools and test equipment. AVS TECHs carry out repairs on miniature, complicated avionics equipment, which requires a high degree of patience and hand eye co-ordination. The AVS TECH must possess the dexterity to make fine adjustments and carry out delicate work on instrument, electrical, electronic and avionics systems.

AVS TECHs are required to work with moving aircraft parts, high-pressure hydraulics / pneumatics, electrical / electronics systems and systems which incorporate explosive devices. Therefore the consequence of error ranges from minor injury or damage to the loss of life or catastrophic damage to valuable equipment.

3.1.1.3 *Aircraft Structure Technicians (ACS TECHs)*

The role of the ACS TECH is to assess, restore and certify by task the structural integrity and airworthiness of an aircraft, to provide the technical expertise necessary to manufacture, modify, design, repair and maintain the aircraft structures, components, assemblies and associated equipment. In conjunction with the other aircraft maintenance personnel, ACS TECHs provide the resource necessary to carry out the ground crew tasks dictated by flying operations within the CF in peacetime or during periods of hostilities both at home units or deployed. Under their control are a multitude of tools, machinery, precision measuring devices, personnel protective equipment including environmental gear and clothing and communication equipment. The ACS TECH must have the physical strength and stamina to lift and move heavy materials and equipment required for the manufacture, modification and repair of aircraft structure, major components and associated equipment. A very high degree of manual dexterity and co-ordination is required combined with high concentration skills to maintain awareness under dynamic environments inherent to on aircraft maintenance (flight line and hangar) and above average mental processing, mathematical skills and memory to deal with close tolerances and precise measurements and calculations.

Failure to comply with engineering orders, errors in judgement or poor workmanship could ultimately result in a catastrophic structural failure of an aircraft causing the loss of human life. Other consequences of error by the ACS TECHs could result in excessive aircraft downtime, damage to or the loss of material resources and severe injury to co-workers through exposure to hazardous materials such as toxins or carcinogens.

3.1.2 CC130 Deployment

Through interviews with AVN and AVS CC130 Maintenance Technicians and a review of resources on CC130 operations, a description of the CC130 operational conditions was developed. ACS technicians were not available at the time of the SME sessions, therefore, ACS tasks were not reviewed.

3.1.2.1 *Maintenance Crew Composition*

Maintenance crews are not assigned to a particular aircraft, instead several maintenance crews are assigned to the deployed fleet as a whole. For example, three crews may be responsible for the maintenance of a fleet of aircraft, such as three CC130s. Maintenance crews for CC130s usually consist of four AVN TECHs, one AVS TECH, and possibly one ACS TECH. As the representation of cross-trained technicians is still in transition, and several more experienced personnel remain specialists, care is taken to ensure that each crew has airframe, engine, safety systems, and electrical systems expertise. Having three to four crews supporting the deployed fleet is not uncommon. Therefore, crews can typically work six- to eight-hour shifts and still provide around-the-clock service when required.

3.1.2.2 *Operating Environment*

The CC130 may be deployed to the full spectrum of climactic conditions in all parts of the world. The ambient operating temperature of the CC130 typically ranges from -50°C for Northern deployments, to +65°C experienced during deployments to equatorial regions. High humidity levels are often experienced in the equatorial climates, particularly at night. As some form of threat is usually present during operational deployments, tactical missions are typically flown that require precautions to be taken such as the installation of armoured plating.

Maintenance technicians on deployment routinely carry out inspections and repairs on elevated platforms or in confined areas of the aircraft, where they are exposed to extremes of noise, fumes,

dust, obnoxious odours, carcinogenic materials and welding flashes. Compounding these difficult conditions is the need to work while wearing restrictive personal protective equipment, and the presence of operational deadlines, hazardous work conditions and significant consequences of errors.

3.1.2.3 Typical Mission Duration

Mission durations vary depending on mission requirements. CC130 missions can range from 3-hour training missions to daily 12-hour missions during operational deployments. Typically, only 1 - 2 missions per day are flown for a given deployed fleet.

3.1.3 Impact of Heat Exposure

3.1.3.1 Civilian Heat Exposure Guidelines

According to the Canadian Centre for Occupational Health and Safety (CCOHS) [5], exposure limits intended to minimize the risk of heat-related illnesses are set by provincial and territorial governments for most Canadian workplaces, and by Labour Canada for workplaces under the federal jurisdiction. These agencies generally use the exposure guidelines recommended by the American Conference of Governmental Industrial Hygienists (ACGIH) (see Table 2), and are based on the Wet Bulb Globe Temperature (WBGT) index. The WBGT is calculated using a formula that takes into account air temperature, speed of air movement, radiant heat from hot objects, sunshine and body cooling due to sweat evaporation.

The United States Department of Labour Occupational Safety and Health Administration (OSHA) uses very similar guidelines to those recommended by the CCOHS [6], and are also based on the ACGIH. As can be seen in Table 2, these guidelines do not account for the full range of temperatures experienced during military operations, with work-rest cycle guidance provided to a maximum of 32.2°C.

Table 2. *Screening Criteria for Heat Stress Exposure (WBGT values in °C) for 8 hour work days per week with conventional breaks*

	Acclimatized				Unacclimatized			
Work Demands	**Light**	**Moderate**	**Heavy**	**Very Heavy**	**Light**	**Moderate**	**Heavy**	**Very Heavy**
100% work	29.5	27.5	26.0	-	27.5	25.0	22.5	-
75% work; 25% rest	30.5	28.5	27.5	-	29.0	26.5	24.5	-
50% work; 50% rest	31.5	29.5	28.5	27.5	30.0	28.0	26.5	25.0
25% work; 75% rest	32.5	31.0	30.0	29.5	31.0	29.0	28.0	26.5

* For unacclimatized workers, the permissible heat exposure should be reduced by 2.5°C

The ACGIH exposure limits are intended to protect most workers from heat-related illnesses. The limits are higher than they would have been if they had been developed to prevent discomfort. If you are wearing heavier clothing then the exposure limit should be lowered. ACGIH recommendations for such situations are suggested in Table 3.

Table 3. *Correction of Threshold Limit Values for Clothing*

Clothing Type	WBGT Correction (°C)
Summer work uniform	0
Cloth (woven material) overalls	-3.5
Double-cloth overalls	-5

3.1.3.2 Military Heat Exposure Guidelines

Several military standards provide guidance on work-rest cycles to maintain physical performance. One DND internal document [7] that applies to the Canadian Forces and civilian workers recommends the same work-rest cycles as those provided by the CCOHS and OSHA, and similarly only provides guidance for temperatures up to 32.2°C. As these limits are not applicable to the entire range of conditions within the scope of the CC130 operational environemnts, they are of limited value.

DAOD 5021-2 [8] does not provide specific guidance on work-rest cycles, but does mandate that CF/DND First Aid training include heat stress. Specifically, the order states that employees must be familiar with the risk factors, pre-disposing factors, signs and symptoms of heat stress illness in order to prevent, recognize and treat it. Maintenance managers interviewed did state that they had received training in these areas.

MIL-STD-1472F [9] addresses human factors issues associated with military environments. However, it is limited to providing guidance on thermal tolerances for inhabited compartments such as ventilation and air-conditioning requirements, and does not address issues relating to heat stress or heat exposure guidelines.

ASCC Document 61/114/16 [10] is an advisory publication that provides guidance for minimizing the impact of heat stress on air operations in the desert or the tropics. The document summarizes current knowledge of heat stress and related factors which impair aircrew and ground crew performance and mission effectiveness, and is intended as an aid for training all types of personnel and especially for briefing troops just before deployment to hot climates. Although the document does not provide specific guidance on work-rest cycles, it does provide guidelines for determining adequate water intake for temperatures up to 55°C.

3.1.4 Control Measures

3.1.4.1 CCOHS Recommended Control Measures

According to the CCOHS [5], the risk of heat-related illnesses can be reduced by engineering controls to provide a cooler workplace, safe work practices to reduce worker exposure, and by training employees to recognize and prevent heat illness.

3.1.4.2 Engineering Controls

Engineering controls are the most effective means of reducing excessive heat exposure. The examples which follow illustrate some engineering approaches to reducing heat exposure.

i. Reducing Metabolic Heat Production (heat produced by the body): Automation and mechanization of tasks minimize the need for heavy physical work and the resulting buildup of body heat.

ii. Reducing the Radiant Heat Emission from Hot Surfaces: Covering hot surface: with sheets of low emissivity material such as aluminium or paint that reduces the amount of heat radiated from this hot surface into the workplace.

iii. Insulating Hot Surfaces: Insulation reduces the heat exchange between the source of heat and the work environment.

iv. Shielding: Shields stop radiated heat from reaching work stations. Two types of shields can be used. Stainless steel, aluminum or other bright surfaces reflect heat back towards the source. Absorbent shields, such as water-cooled jackets made of black-surfaced aluminium, can effectively absorb and carry away heat.

v. Ventilation and Air Conditioning: Ventilation, localized air conditioning, and cooled observation booths are commonly used to provide cool work stations. Cooled observation booths allow workers to cool down after brief periods of intense heat exposure while still allowing them to monitor equipment.

vi. Reducing the Humidity: Air conditioning, dehumidification, and elimination of open hot water baths, drains, and leaky steam valves help reduce humidity.

3.1.4.3 Personal Protection

Ordinary clothing provides some protection from heat radiated by surrounding hot surfaces. Specially designed heat-protective clothing is available for working in extremely hot conditions. In hot and humid workplaces, light clothing allows maximum skin exposure and efficient body cooling by sweat evaporation.

Work that requires the wearing of impermeable clothing presents an added heat burden as the clothing reduces the body's ability to dissipate heat. Under such circumstances, it is often necessary to reduce the exposure limit values of WBGT to levels below those appropriate for workers wearing light clothing.

3.1.5 Current CC130 Technician' SOPs for Risk Reduction

As indicated in Table 4 below, several control measures are in place to reduce the risk for CC130 maintenance technicians working in hot environments while on deployment. A description of them is provided below:

Table 4. *Summary of Control Measures*

Recommended Method of Control	Action	Status of Current SOPs in Hot Environments
Engineering Controls		
Reduce body heat production	Mechanize tasks.	YES
Stop exposure to radiated heat from hot objects	Insulate hot surfaces. Use reflective shields, aprons, remote controls.	NO (gloves only)
Reduce convection heat gain	Lower air temperature. Increase air speed if air temperature below 35°C. Increase ventilation. Provide cool observation booths.	YES (mobile a/c units in aircraft)
Increase sweat evaporation	Reduce humidity. Use a fan to increase air speed (movement).	YES

Recommended Method of Control	Action	Status of Current SOPs in Hot Environments
Clothing	Wear loose clothing that permits sweat evaporation but stops radiant heat. Use cooled protective clothing for extreme conditions.	YES
Administrative Controls		
Acclimatization	Allow sufficient acclimatization period before full workload.	NO
Duration of work	Shorten exposure time and use frequent rest breaks.	YES
Rest area	Provide cool (air-conditioned) rest-areas.	YES
Water	Provide cool drinking water.	YES
Pace of work	If practical, allow workers to set their own pace of work.	YES
First aid and medical care	Define emergency procedures. Assign one person trained in first aid to each work shift. Train workers in recognition of symptoms of heat exposure.	YES (Management Receives some Training)

3.1.5.1 Engineering Controls

Automation of tasks is employed whenever possible through the use of specialized tools such as jacks, winches, and cranes. However, due to aircraft regulations, power tools (e.g. power drills, screwdrivers, torque wrenches) cannot be used on aircraft as they may cause damage to aircraft structures. This increases the potential for increased greater metabolic load as the physical requirements to remove and install aircraft panels, doors and components must be performed without the aid of power-assisted tools.

If maintenance activity is required to be performed inside an aircraft on a hot day, convection heat is reduced by installing mobile air-conditioning units inside the aircraft. Units are typically installed 30 minutes prior to commencing work.

3.1.5.2 Personal Protection

All military personnel wear military issued clothing and equipment including desert boots, 100% cotton shirts, pants, 100% cotton coveralls, sunscreen, prescription sunglasses, socks, and gloves. Maintainers consistently commented that the clothing and equipment provided is excellent. In particularly, the new desert safety boots are breathable, light and very comfortable. One recommended change made by maintainers was to replace the 100% cotton t-shirts with athletic style breathable t-shirts. Cooling vests were viewed negatively as they would be too heavy, bulky, and restrictive for the physically demanding nature of their work, and would hinder comfort and performance to an unacceptable level.

Radiant heat from aircraft surfaces exposed to direct sunlight for extended periods of time poses a significant risk to maintenance technicians. During SME reviews it was noted that the surfaces of the aircraft can radiate heat to such extremes that direct exposure to unprotected skin can cause

third degree burns. When required, operators don protective gloves when working on these surfaces.

3.1.5.3 Administrative Controls

In terms of administrative controls, officers are informed of risks associated with heat stress as well as general guidelines to maintain physical performance prior to deployment to extreme environments. Although they are not provided with the guidelines for managing specific work/rest cycles, management is aware of their responsibility for the safety of their crews, and will monitor crews when conducting work in extreme climates. Monitoring by management is particularly crucial during high-profile and time critical missions, as many crewmembers will tend to push themselves to their physical limits. In this case, management may have to force crewmembers to take breaks if they deem necessary. A mission may be postponed if managers feel that work conditions are becoming unsafe.

Crews are also encouraged to self-monitor, pace themselves and take as many rest breaks as required even if work must be transferred to the next shift to complete. Specific work/rest cycles will vary depending on individual differences such acclimatization, and fitness level, as well as mission demands and environmental conditions. Working twenty minutes on followed by 20 minutes rest in an air-conditioned rest area is not uncommon.

As temperatures can reach into the 40s and 50s on deployment work /rest cycles implemented far exceed the recommended ACGIH exposure limits. As can be seen in Table 2, even for the maximum temperature listed (32.5°C) under the most ideal conditions (acclimatized worker, conducting light work) 25% work to 75% rest is recommended. Although following the ACGHI guidelines would not be practical in a deployed setting, care is taken to avoid working in the heat as much as possible.

Portions of A Checks conducted inside the aircraft are typically performed upon arrival of the aircraft, when the aircraft is still cool from air-conditioning, while the portions that must be conducted on the exterior of the aircraft are left until later in the evening when conditions are cooler. B Checks are conducted the evening before the mission whenever possible as are all other physically demanding tasks such as conditional inspections and repairs on the exterior of the aircraft

Water is always available in all rest areas and quarters and crews are encouraged to drink water frequently. If a crew must work outside in hot conditions due to operational requirements, other crewmembers and management will often bring them water.

3.1.5.4 Nuclear, Biological, Chemical (NBC) Environments

Although all technicians undergo NBC training, due to the deficiencies with the NBC equipment (bulkiness, poor visibility) only two-handed tasks (no fine motor skills) are possible. For example, it may be possible to change a tire, load/ unload equipment, or turn power on. In addition, it was noted that the visual deficits created by the NBC goggles impair vision to the point of rendering the ability to perform visual inspections impossible and many of the routine maintenance inspections cannot be adequately conducted.

As very little oxygen is provided with the suit, it can only be worn for a few minutes. Since NBC suits are impermeable, they do not allow the body to dissipate heat, and are consequently extremely hot. For this reason, technicians would only work with NBC gear for short periods of time (e.g. a few minutes).

3.1.6 Mission Scenario

The following mission scenario was developed for the CC130 MFTA project. The purpose of the mission scenario is to provide an anchor point for the mission, function and task analysis. Special care was taken to ensure that coverage of broad functional activities such as regular preventive maintenance procedures and corrective maintenance were included. The subset of functions selected for inclusion was deemed sufficient to represent the full range of functions performed during deployed operations. A mission flow diagram is presented in Annex A.

3.1.6.1 Scenario Overview

The mission developed for the scenario is the preparation, conduct and post-mission activities relating to a supply drop operation conducted in the Gulf. The goal of the mission is to provide food and medical supplies to coalition supporters in need. This scenario was selected as it represents a realistic mission that is conducted by the Canadian Forces.

3.1.6.2 Assumptions

The assumptions regarding factors such as the maintenance crews, maintenance cycle, and environment are detailed in Table 5.

Table 5. *Scenario Assumptions*

Assumptions
Tactical Mission (i.e., enemy forces are present in the area)
Armor plating is installed on the aircraft
A typical base camp is setup including air-conditioned rest areas and quarters
The CC130 is not configured in air-to-air refueling mode
The sequence of activities are representative of a typical maintenance cycle
The deployed fleet consists of three CC130s being supported by three maintenance crews
One to two missions are flown each day
It is mid-July in the Gulf, and the high for the day is 45°C.
The mission begins with a message from 1CAD at 1:00 am.

3.1.6.3 Chronological Sequence of Mission Events

All times are in Coordinated Universal Time or UTC.

18 July 04

0100hr Gulf base advised by 1Air Command (1 CAD) that supply drop mission is required.

0200hr Aircrew (Pilots, FE, and Loadmaster) are briefed on mission details. The goal of the mission is to drop food and medical supplies to coalition members in need.

0245hr The Captain reviews the Maintenance Record Sets (MRSs) for each available CC130 to determine the status of maintenance and aircraft mission capabilities and assigns a tail number accordingly.

0255hr The maintenance crew on duty configures the aircraft for the supply drop mission by configuring the cargo hold area to receive supplies. All seats are removed to ensure adequate space for cargo.

0355hr The AVN TECH reviews results of the previous A Check conducted on the aircraft, determines the oxygen system needs to be topped up. The AVN TECH advises all other technicians that liquid oxygen servicing is about to begin, as no other tasks can be conducted concurrently.

0425hr The AVN TECH fuels the aircraft to a ramp level, which is the load required to ensure that the aircraft does not blow around on the ramp due to winds.

0455hr The AVN TECH tops up the fuel based on mission requirements.

0510hr The AVN and AVS TECHs conduct the B Check.

0600hr The Mobile Air Movement Section (MAMS) loads the cargo into the aircraft.

0900hr FE reviews the MRS for the aircraft and conducts a pre-flight check of the aircraft.

0900hr FE discovers plastic seal on FE's repair kit is broken.

0915hr Maintenance is contacted, inspects the repair kit, and re-seals it.

0930hr Aircraft Captain is called and conducts one final review of the MRS prior to take-off.

1000hr Aircraft takes-off and follows the pre-planned mission route.

1230hr Aircraft arrives at supply drop location, opens the ramp, and loadmaster begins to drop supplies.

1235hr As supplies are being dropped, the aircraft experiences small weapons fire from the ground which causes the pilot to make a maximum manoeuvres which leads to an indicated torque of 21 000 inch/pounds and a Cargo, Ramp and Door Overspeed condition to occur.

1245hr Aircraft returns to home base.

1600hr Aircraft lands at home base.

1610hr Maintenance crew is debriefed by the FE on possible maintenance issues including the Engine Overtorque, Cargo, Ramp and Door Overspeed. Data from the Flight Data Recorder (FDR) is downloaded and the conditions are verified.

1625hr AVN & AVS techs conduct A Check.

2000 hr AVN TECH conducts a Condition 2 Engine Overtorque Conditional Inspection (CON 20)

2300 hr AVN TECH conducts Cargo, Ramp and Door Overspeed Conditional Inspection (CON 26)

0400 – 72hr post mission, AVN and AVS TECHs conduct Operation in Sand, Dust and High Ambient Temperature Conditional Inspection (CON 19).

3.2 Function Analysis

The mission scenario provided the foundation upon which to build the function analysis. The highest level functions in the analysis were derived from the servicing level and conditional inspection schedule for the CC130 [11] and from interviews with SMEs conducted at CFB Trenton. Each of these high level functions was integrated within the Task Architect Tool and

decomposed into their related sub-functions. The related Function Flow Diagrams are presented in Annex B.

3.2.1 CC 130 Maintenance Activities

Typical maintenance activities are defined in relation to first, second and third line maintenance activities. First line maintenance is conducted during deployed and conventional settings, and includes functions related to pre- and post-flight inspections, and conditional maintenance activities related to servicing aircraft that have exceeded an operational threshold. Second line maintenance generally requires a lab setting and often involves a significant level of repair to aircraft equipment and systems that is beyond the scope for typical deployed capabilities. . Third line maintenance is typically conducted at the equipment manufacturers or other contracted facility and involves detailed functions such as electrical and avionics repair and engine rebuilds.

Due to the limitations associated with the facilities and equipment available on deployment, most large scale preventive maintenance activities for the CC130s are conducted prior to deployment. These large scale maintenance activities include Consolidated Periodic Inspections, which are required every 850 – 900 hours and Progressive Structural Inspections which are required every 3400 – 3800 hours. Aircraft which are due for these large-scale inspections are never sent on deployment. In times of war, however, some discretion is permitted. Specifically, a Contingency Aircraft Maintenance Program (CAMP) can be implemented which reduces the maintenance activities required and changes the inspection sequence.

Preventive maintenance activities which are conducted in theatre include supplementary, conditional, primary inspections and post- and pre-flight Checks. Each of these high level functions is discussed briefly in the sections below.

3.2.1.1 Pre- and Post Flight Checks

The following section describes the pre- and post-flight inspections regular conducted for the CC130.

3.2.1.1.1 B Check

B Checks are mandatory inspections that are performed pre-flight to ensure that an aircraft is certified to fly. Upon completion, the B Check certification is valid for 8 hours during regular operations, but can be extended to be valid for up to 24 hours on deployment when required for operational readiness standby. These inspections consist primarily of visual inspections of aircraft interior and exterior surfaces, components and avionics systems for serviceability (see Annex C).

Physical task demands are generally minimal, with the highest levels of effort relating to climbing ladders to conduct engine and power-plant inspections, manoeuvring on the top surface of the aircraft to visually inspect the dry bays, wings and antennas, and crawling under aircraft components such as wheel wells to inspect the landing gear, wheels and related systems.

In hot environments, B Checks are conducted during night conditions to ensure that exterior aircraft surfaces are as cool as possible to minimize the risk of burns to the maintenance technicians. For interior checks, portable air conditioners are provided to offset high ambient temperatures associated with operations in these environments. However, maintenance technicians must still monitor their performance in order to minimize heat exposure and maintain adequate hydration levels, especially when operating on the exterior of the aircraft.

3.2.1.1.2 A Check

A Checks are performed post-flight, and consist primarily of visual inspections of aircraft surfaces, components, avionics systems. Similar to the B Check inspections, the most physically demanding portion of the A Check is the completion of tasks that require climbing on top of the aircraft (e.g., checking the dry bays, panels, and antennas for bird-strike), or crawling under larger aircraft components such as wheel wells to inspect the landing gear and related systems.

As A Checks are conducted post-flight, aircraft exterior surfaces can become extremely hot and pose a significant danger to maintenance technicians if inspections are conducted during the day and the aircraft has been exposed to direct sunlight for extended periods of time. Maintenance crews will often postpone external aircraft inspections until the airframe has cooled significantly. However, the inspection of internal aircraft components may be conducted during the day, and wherever possible, portable air conditioners are provided to offset high ambient temperatures within the aircraft. Operators must still monitor their performance in order to minimize heat exposure and maintain adequate hydration levels.

Tasks are not typically conducted in a defined sequence. For example, most technicians will conduct all interior checks followed by the exterior checks. Checklists are used to confirm that all tasks have been completed (see Annex C).

3.2.1.1.3 A-B Check

A-B Checks, also called Quick Turn-Around Checks, replace the respective A and B checks when the aircraft is on the ground for less than 3 hours between takeoff and landing, and consist of a reduced set of tasks compared to the A and B Checks (see Annex C). Due to the nature of the AB check, the postponement of maintenance duties until cooler night conditions occur may not be feasible if an aircraft must be re-tasked during daytime conditions. Extra pre-cautions must be taken to ensure the heat exposure is kept to a minimum and adequate hydration is maintained. Additional risk-factors may arise due to increased time-pressure experienced by maintenance technicians associated with the requirement to service an aircraft within a short period of time.

3.2.1.2 Supplementary Check

Supplementary Checks are performed every 405 to 495 hours with a maximum successive Supplementary and Periodic Inspections time limit not to exceed 495 hours. Functions associated with the supplementary inspection include consolidate lubrication, corrosion and air-to-air refuelling inspections. The majority of time-expired components are also replaced during this inspection period. If it is necessary to conduct a Supplementary Inspection in theatre, an abbreviated list of tasks is completed depending on the degree of task difficulty. As Supplementary Inspections are rarely conducted in theatre and never conducted in their entirety, they were not included as part of the function analysis.

3.2.1.3 Primary Inspection

Primary Inspections are conducted every 150 flight hours, and as with A, B, and A-B Checks they consist primarily of visual inspection tasks, and minor physical tasks which are high in cognitive demand, but relatively low in physical demand. Due to the similarity of the Primary Inspection tasks to the A, B and A-B checks, function and task data were not provided as part of the current analysis. However, a function and task listing is provided for the Primary Inspection in Annex C.

3.2.1.4 Conditional Inspection

Conditional Inspections are only conducted when specific problems are suspected, or when aircraft limitations have been exceeded during flight. Typically they are very thorough

inspections that are physically demanding and required the removal of large aircraft components such as engines, landing gear, and hydraulic systems. Specific maintenance functions include detailed inspections, restoration, and the replacement of major aircraft components.

Due to the heavy physical demands associated with many of the Condition Inspections, maintenance technicians will only perform these during night conditions. The level of effort required is also distributed over longer periods of time in order minimize the physical strain on the maintenance staff. If significant maintenance issues are identified, these may be offloaded to a third-party contractor as the capability may not exist, or the negative impact on maintenance staff is identified as being to extreme to conduct in the environmental conditions experienced in hot environments.

For the purposes of the current analysis, a representative set of Conditional Inspections was reviewed with SMEs to provide a detailed understanding of the associated maintenance activities. Function flow diagrams (Annex B) and function and task tables (Annex C) are provided for the following Conditional Inspections:

i. Operation in Sand, Dust or High Ambient Temperatures (CON 19)

ii. Engine Overtorque (CON 20)

iii. Cargo and Door and Ramp Overspeed (CON 26)

3.2.2 Maintenance Errors

Consequences of errors by aircraft maintenance technicians can range from minor injury or damage to aircraft systems to the loss of life or catastrophic damage to valuable equipment. For this reason many precautions are put in place to ensure that errors are minimized.

3.2.2.1 Publications

While on deployment, a library of all required maintenance publications is provided on-base.. For specific maintenance activities, technicians must photocopy the appropriate pages from the related publication to use as a reference while performing their tasks. As the publications change frequently, maintenance publications are updated regularly, and old copies of documentation are destroyed.

3.2.2.2 Selection of Crews

In order to maintain current qualifications, technicians are evaluated regularly and are required to maintain professional certification within their occupational specialty. Due to the demanding environment and critical nature of the missions flown on deployment, the vast majority of technicians selected for deployed operations are highly experienced. Inexperienced technicians may be deployed if resources are not sufficient, but are monitored carefully by senior staff.

3.2.2.3 Task Verification

Maintenance checklists are used to ensure that all required tasks have been conducted for specific maintenance routines. As the maintenance routine is conducted, each task within the checklist must be signed-off by the technician conducting the task upon completion. If the maintenance activity involves flight critical aspects, then an independent inspection by another authorized technician must be performed. The independent technician must also sign the maintenance checklist confirming that all tasks were completed satisfactorily. The maintenance supervisor will then also sign-off on the maintenance task. Prior to a mission, the FE will conduct another check of the entire aircraft prior to accepting the aircraft from the maintenance department.

3.2.2.4 Error Rates and Operator Performance

Unanimous opinion across all SMEs interviewed noted that the high degree of training, certification requirements, and strict maintenance procedures adhered to by maintenance staff minimizes the opportunity for errors. SMEs reported that errors (both omissions and commissions) do occur, but only in very isolated cases. SME provided only one example of an error whereby an operationally restricted fuel tank was fuelled erroneously. Operator errors that would impact the flight-safety of the aircraft were stated as never occurring. However, error rates are difficult to assess through SME interviews as operators may not admit to actual errors that they have conducted on an individual and organizational basis.

During deployment, SMEs noted that error rates typically decrease when compared to operations conducted at the Main Operating Base. Reasons include a perceived increase in the importance of the work on the part of maintenance staff, a reduction in outside influences (e.g. personal factors, lack of family stress), and an increase in the desire to conduct work to pass the time in relatively isolated conditions. Conversely, technicians did acknowledge that factors such as the extreme temperatures, high-altitude and an increase in depression due separation from family and friends can negatively impact some technicians' performance.

The impact of extreme environmental temperatures on operator performance, though not formally addressed through policy, was seen as adequately addressed through informal means. Maintenance officers responsible for staff management stated that work/rest cycles are continually monitored and adjusted to ensure that operators are not over-tired or over-heated. Air-conditioned facilities are provided as shelter from high temperature environments during rest periods, and portable air-conditioners are provided to cool aircraft interiors in order to minimize heat exposure. Maintenance tasks that are conducted on external aircraft surfaces are postponed until cooler night conditions are attained to minimize heat exposure to ambient and radiant heat, and prevent contact burns from high-temperature aircraft surfaces. Maintenance technicians are encouraged to maintain hydration levels, and water is supplied in abundance and easily available. All forms of barracks, such as sleeping quarters and mess tents are also provided with air-conditioning in order to reduce heat exposure where possible.

Some concerns were noted during the initial period of a deployment to an extremely hot environment. A period of initial adaptation to the extreme temperatures is a factor that maintenance staff must accommodate when developing work-rest cycles for operations upon initial deployments. SMEs noted that a reduced set of operations is typically conducted when first deployed to ensure that adequate adaptation has occurred for both maintenance staff and aircrews. However, staff must be monitored at all times as adaptation to heat occurs at varying rates dependant on factors such as individual fitness level and age.

3.3 Task Analysis

The functional groupings established during the function analysis were further decomposed into their supporting tasks and activities and incorporated into the Task Architect tool. Detailed Function/Task tables can be found at Annex C.

The servicing level and conditional inspection schedule for the CC130 [11] was the primary source for the task breakdown. Pre- and post-flight checks such as the A, B, and A-B Check as well as the Primary Inspections and Conditional Inspections were broken down into their component tasks.

Timing data was captured from AVN and AVS technicians for each lower level task that made up the A Check, B Check, and Conditional Inspections. As the A-B Check is a sub-set of A and B Check tasks, technicians confirmed that task timings for the A-B tasks would be identical to the those tasks contained in the A and B check, with a few minor exceptions which were identified.

Although the Primary Inspection was broken down into its low-level tasks, upon review it was determined that the task were very similar to the other pre- and post-flight checks and that their inclusion in the analysis would not add any insight into CC130 technician' task demands beyond what would be obtained for the other pre- and post-flight functions.

An analysis of lower-level tasks for the A, B, and A-B Checks and Conditional Inspections was then conducted by the HF team. The Visual and Cognitive component of workload were assessed and workload measures were allotted to each task. Visual and Cognitive workload values were assigned based on the VACP measures from the McCraken and Aldrich workload model (Annex D). Supporting photographs taken from the 8 Air Maintenance Squadron are provided in Annex E.

Each task was then categorized for Work Intensity based on the ASCC standard on heat stress [10]. Work Intensities varied from 'very low' to 'heavy', and were assigned based on a comparison with the values provided in Table 6 Task requirements were identified such as the location where each task is performed (i.e., Main Operating Base (MOB), deployment or both) or whether the tasks is reserved for air-to-air refuelling operations.

Table 6. *Work Intensity Ratings*

WORK INTENSITY STANDARD CLOTHING	ACTIVITY	WORK INTENSITY NBC PROTECTIVE GEAR
VERY LOW	Resting Standing Sitting Guard Duty Driving Vehicle	VERY LOW
LOW	Cleaning Personal Weapons Walking Hard Surface/ 2 mph No Load Routine Aircrew In-Flight Operations Walking Hard Surface/ 2 mph 40~60 lb Load	LOW
MODERATE	Walking Loose Sand/Snow 2 mph No Load Aerial Combat & Disabled Aircraft Operations Pre-flight Inspection Maintenance of Vehicles & Aircraft Callisthenics	MODERATE
	Walking Hard Surface/ 4 mph 40 lb Load Repair Aircraft and Vehicles Loading & Handling Cargo Pick And Shovel	HEAVY

WORK INTENSITY STANDARD CLOTHING	ACTIVITY	WORK INTENSITY NBC PROTECTIVE GEAR
	Foxhole Digging	HEAVY
HEAVY	Emplacement Digging	
	Rapid Runway Repair	HEAVY
	Walking Loose Sand/Snow 3.5 mph No Load	

3.3.1 B Checks

The majority of the B Check is performed by the AVN TECH with the AVS TECH conducting one function related to sensor systems. Most tasks associated with the B Check are performed at the MOB and on deployment. B Check tasks are typically short in duration, however if an serviceability issue is discovered, longer tasks such as replenishing the oxygen may be required. Replenishing oxygen can take up to 1.5 hours to the exclusion of all other tasks. B Check tasks are primarily visual inspection tasks which range in visual demand from discrete inspections to reading symbols from specific instrumentation. Cognitive demands range from simple associations to evaluating multiple sources of information. Little physical effort is typically required with most tasks ranging from very low to low in work intensity. Examples of the most physically demanding tasks include cleaning the windshield, stowing loose equipment or opening doors or hatches to facilitate visual inspections as seen in Figure 1.

Figure 1. *AVNs Opening Left Landing-Gear Compartment to Prepare for Visual Inspection*

3.3.2 A Check

The majority of A Check tasks are performed by the AVN TECH with the AVS TECH conducting a few tasks relating to the communications and radar systems. As with the B Check, most tasks associated with the A Checks are required both at the MOB and on deployment. Most tasks are typically short in duration with longer tasks required if deficiencies are found. A Check tasks are primarily conducted through visual inspection of aircraft components which range in visual task demands from discriminating visual differences to reading symbols on instrument displays. Cognitive demands range from simple associations to evaluating multiple sources of information. Little physical effort is typically required with tasks ranging from very low to low in work intensity. Examples of the most physically demanding tasks include cleaning the windshield, stowing loose equipment or tasks which involve climbing on top on the aircraft.

3.3.3 Conditional Inspection Operation in Sand, Dust or High Ambient Temperatures (CON 19)

The Sand, Dust or High Ambient Temperatures Conditional Inspection is performed by AVN TECHs and consists of very long in duration, in-depth tasks which typically take several minutes to hours to complete, with tasks varying from low to heavy work intensity. AVNs must use a stand, open engine covers, and take some components apart as part of the inspection. One of the most physically demanding tasks is the propeller and components inspection which requires use of a crane, removal of the propeller assemblies, and can last 1 hour per propeller. Two technicians are required for several tasks and may require work to be conducted across several days.

3.3.4 Conditional Inspection Engine Overtorque (CON 20) Condition 2

The Engine Overtorque Condition 2 Inspection is performed by the AVN TECHs and consists of very long in duration, in-depth tasks which typically take several minutes to several hours to complete with tasks varying from low to moderate intensity. Although many of the tasks are visual inspections, aircraft components must be disassembled and ladders must be moved several times for each engine. Several tasks also involve climbing on top of the wing which can be physically demanding. These tasks are typically conducted at night. Visual demands involve discrete inspections, and cognitive demands range from evaluating multiple sources of information to determine the serviceability of specific components.

3.3.5 Conditional Inspection Cargo and Door and Ramp Overspeed (CON 26)

The Inspection Cargo and Door and Ramp Overspeed Inspection is performed by the AVN TECHs and consists of very long in duration, in-depth tasks which typically take several minutes to several hours to complete and vary from low to moderate intensity. Although many of the tasks are visual inspections, some tasks require removing panels and climbing into confined spaces such as in the platypus portion of the aircraft as seen in Figure 2. Overall, this Conditional Inspection may require up to 6 technicians in order to complete some fo the more demanding tasks. Visual task demands involve discrete inspection and cognitive demands involve evaluating multiple sources of information to determine the serviceability of specific components.

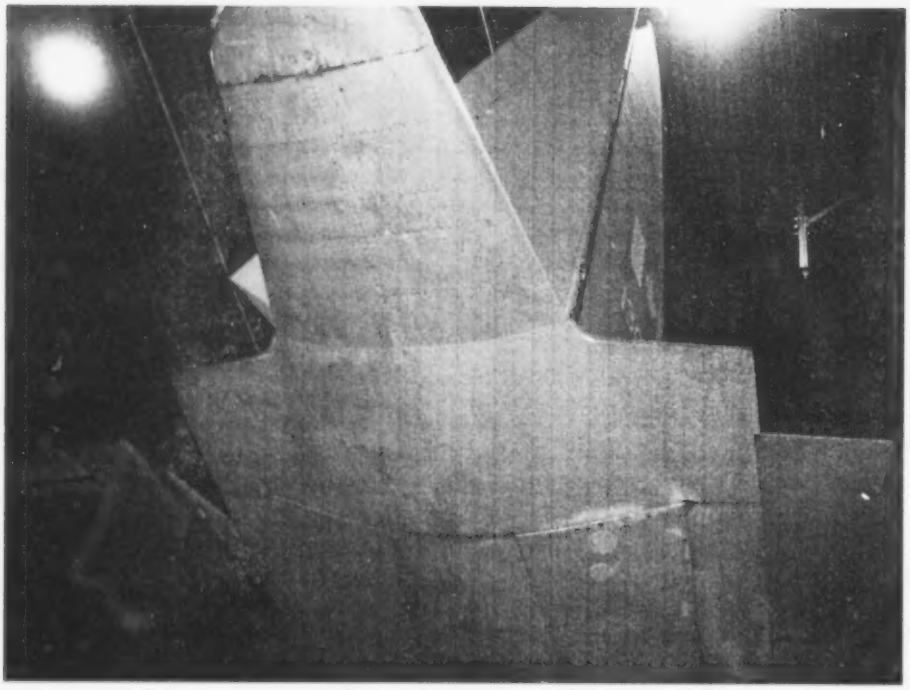

Figure 2. *External view of Platypus access to rudder torque arms and elevator hinge points.*

4 Discussion

During the conduct of the Mission, Function and Task Analysis, a number of points were raised that warrant further discussion.

4.1 Operator Errors

The assessment of true operator error-rates can be difficult when relying solely upon SME assessments. As previously discussed, operator testimony and reporting of errors can be influenced by the desire to obscure the presence of errors in order maintain the perception of competency, both individually and as an organization. However, recent movements within Air-Force organizations has attempted to alleviate the culpability associated with making and reporting errors, thereby improving overall estimates of error-rates.

For the purposes of the current study, error rates were assessed exclusively through reviews held with SMEs. In order to validate the current results, a review of existing documentation relating to Unsatisfactory Condition Reports (UCRs) and Flight Safety Incident Reports (FSIRs) may be worthwhile. These documents should be available through the Directorate of Flight Safety (DFS), and may indicate frequency of occurrence of errors to support the results obtained during the SME interviews.

4.2 Health and Safety Standards

There is currently a lack of standardized approaches to the management of high temperature operating environments on operator performance within the Canadian Forces. Though guidelines do exist to manage heat-related illnesses such as heat-stroke and heat-rash, it is currently the responsibility of maintenance supervisors to define ad-hoc control measures to compensate for operations in high temperatures.

Existing OCSH and American Occupational, Safety and Health Administration (OSHA) guidelines only extend to operating environments up to 30.0°C, and do not include the extreme temperatures experienced during deployments. ASCC documentation does exist that encompasses higher temperature environments (e.g. up to 37°C) and relates specifically to water intake levels and dehydration prevention. However, this documentation is not widely known among the maintenance operators reviewed in the current analysis and efforts should be made to improve the dissemination of this material.

4.3 Operations in NBCD Conditions

The impact of NBCD clothing on maintenance tasks is poorly defined. Through SME interviews, it was noted that the majority of maintenance tasks could not be conducted due to a significant impairment in vision and a decrease in the ability to conduct fine-motor tasks while wearing NBCD clothing. In addition, the perceived impact of thermal strain in high-temperature environments would prevent the majority of maintenance tasks from being conducted during NBC conditions. However, the SMEs interviewed possessed no first-hand experienced conducting maintenance tasks while wearing NBCD clothing and it is difficult to determine the exact impact that NBCD conditions may have on maintenance task performance.

Further research should be conducted that integrates the existing task data into the Integrated Performance Modeling Environment and an associate thermal-strain model to assess operator performance in standard and NBCD conditions.

5 Conclusion

The conduct of work associated with this program has culminated in the following conclusions:

i. An Initial Mission, Function and Task Analysis was conducted to review typical maintenance functions and tasks associated with the CC 130 aircraft.

ii. A literature review was conducted to define the roles and responsibilities of CC130 maintenance technicians. Additional data was gathered reviewing current Occupational Safety and Health guidelines for operations within high-temperature environments.

iii. A series of SME sessions were held at CFB Trenton with CC 130 maintenance technicians to define a representative operational scenario within which to conduct further function and task analyses. The results of these analyses were recorded and used to generate a series of function flow diagrams and function and task tables.

iv. The results of the analysis provided a detailed understanding of the impact of hot environments on operator performance and current SOPs for operating within these environments. Recommendations were provided to conduct further research in this area, and to assist in the definition of specific guidelines for aircraft technicians operating in extreme environments.

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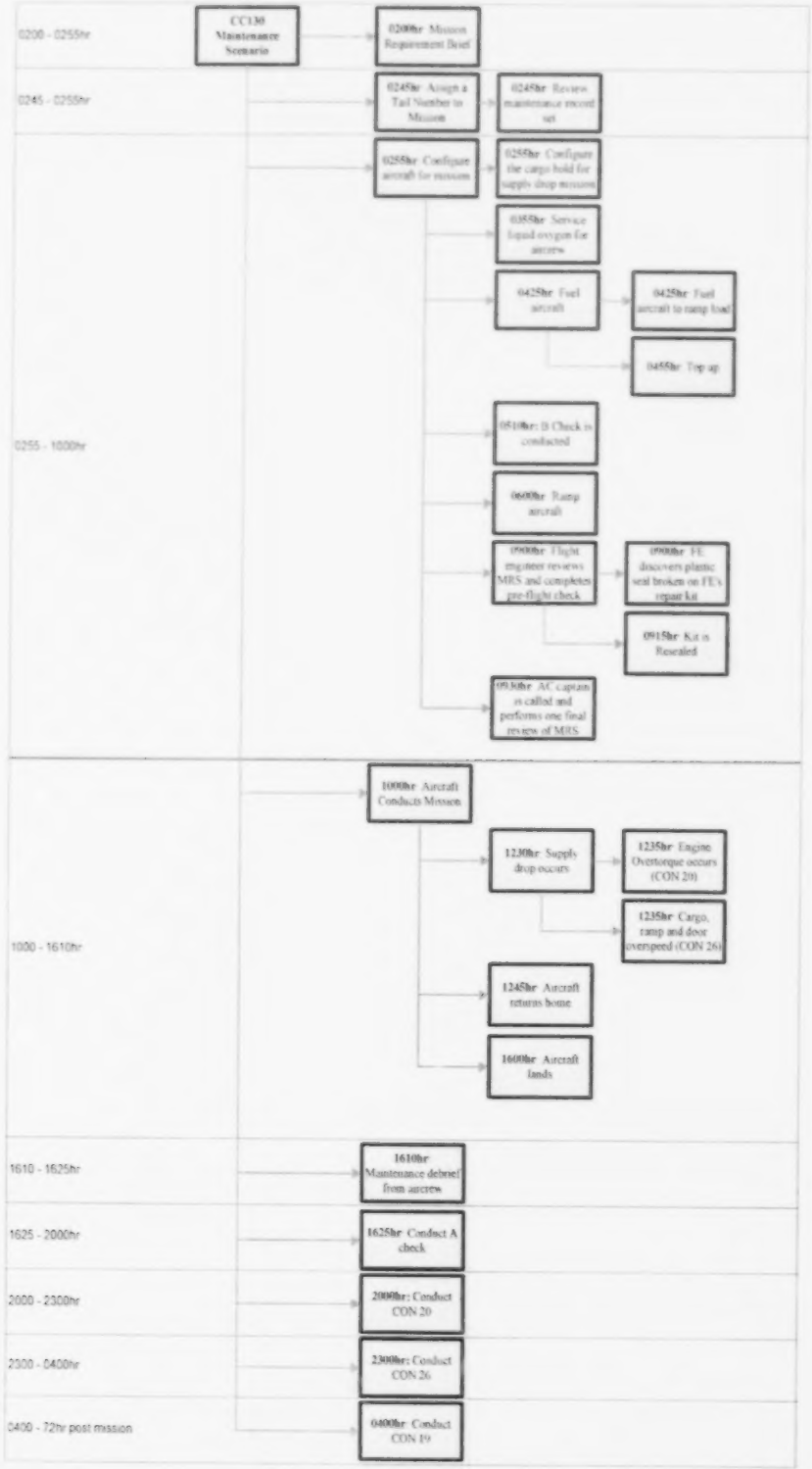
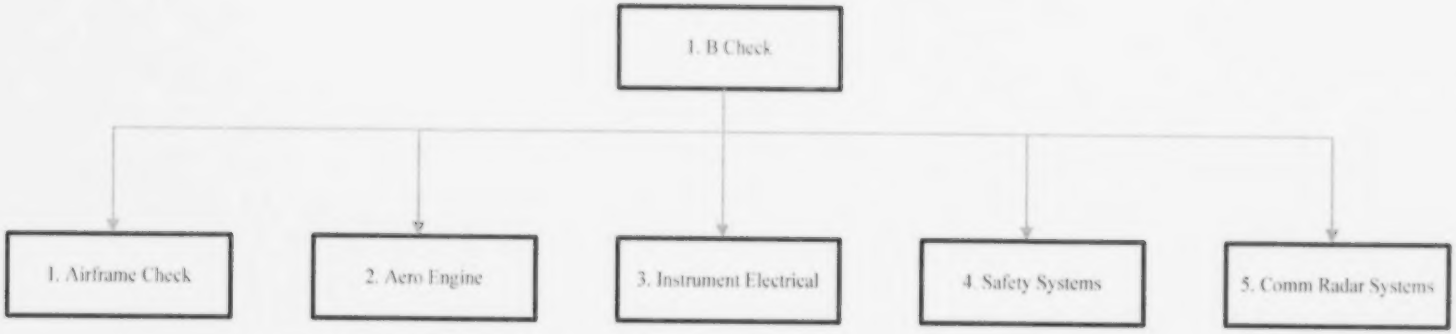
Annex A - Mission Flow Diagram

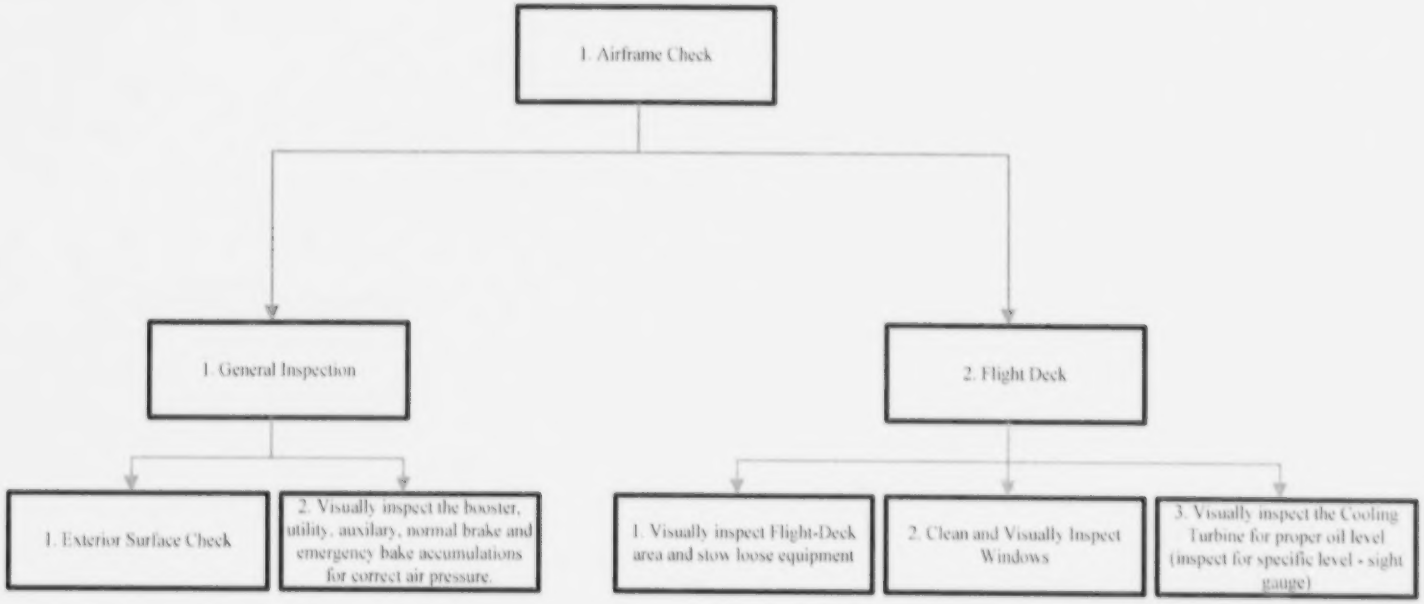

0200 - 0255hr
CC130 Maintenance Scenario
0200hr Mission Requirement Brief
0245 - 0255hr
0245hr Assign a Tail Number to Mission
0245hr Review maintenance record set
0255 - 1000hr
0255hr Configure aircraft for mission
0255hr Configure the cargo hold for supply drop mission
0355hr Service liquid oxygen for aircrew
0425hr Fuel aircraft
0425hr Fuel aircraft to ramp load
0455hr Top up
0510hr: D Check is conducted
0600hr Ramp aircraft
0900hr Flight engineer reviews MRS and completes pre-flight check
0900hr FE discovers plastic seal broken on FE's repair kit
0915hr Kit is Resealed
0930hr AC captain is called and performs one final review of MRS
1000 - 1610hr
1000hr Aircraft Conducts Mission
1230hr Supply drop occurs
1235hr Engine Overtorque occurs (CON 20)
1235hr Cargo, ramp and door overspeed (CON 26)
1245hr Aircraft returns home
1600hr Aircraft lands
1610 - 1625hr
1610hr Maintenance debrief from aircrew
1625 - 2000hr
1625hr Conduct A check
2000 - 2300hr
2000hr: Conduct CON 20
2300 - 0400hr
2300hr: Conduct CON 26
0400 - 72hr post mission
0400hr Conduct CON 19

Annex B – Function / Task Flow Diagrams

B Check
High Level Functions



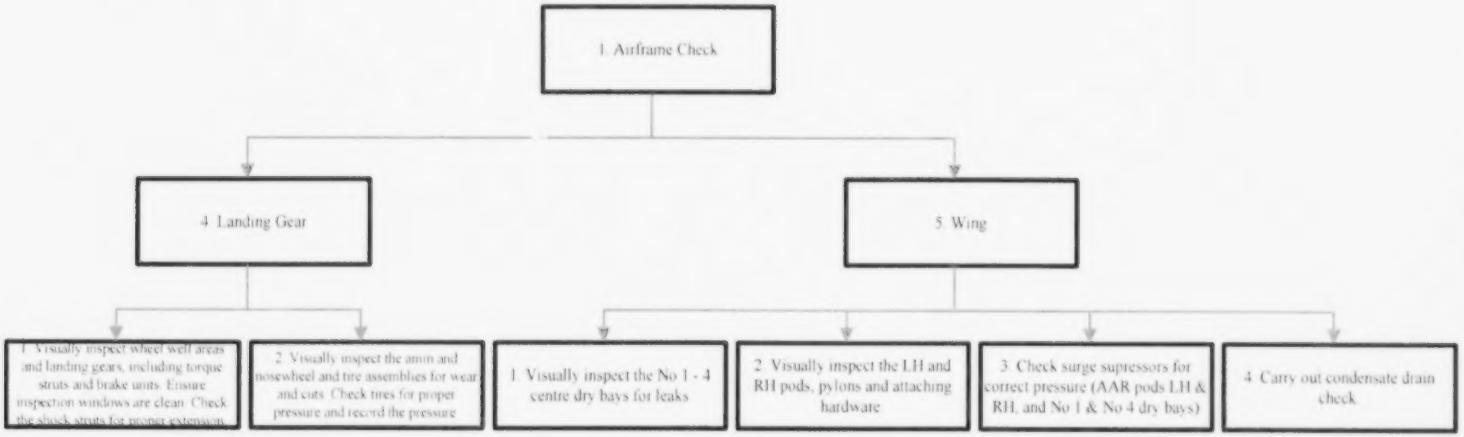
B Check – Airframe
General and Flight Deck Inspection

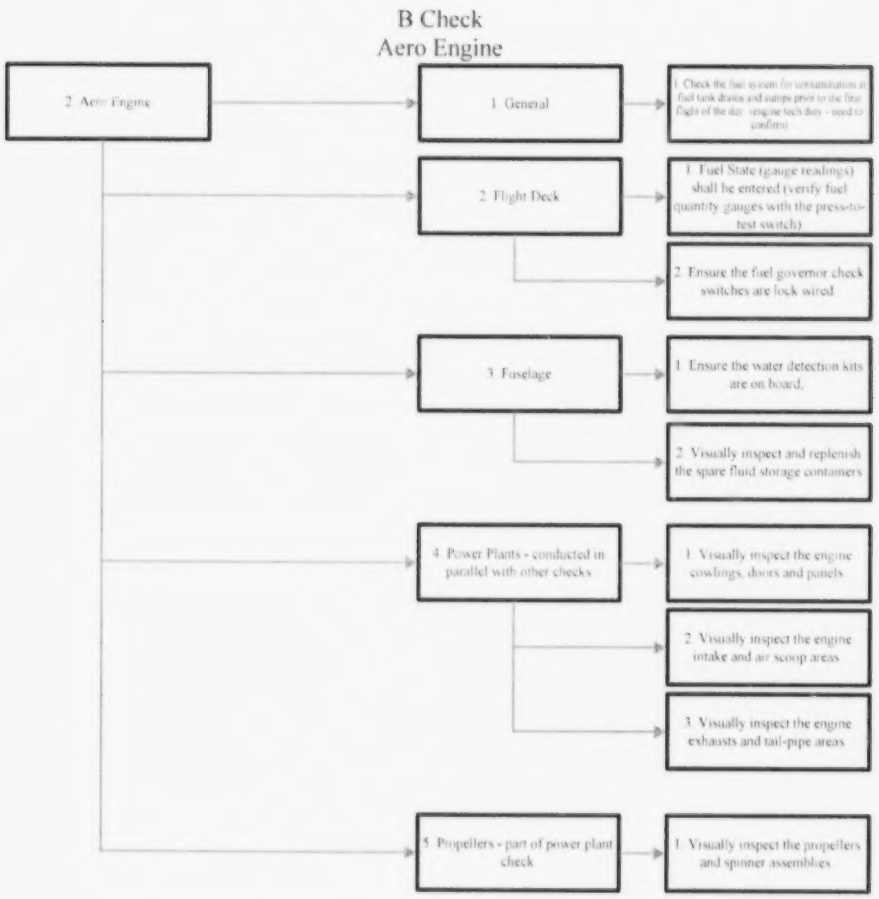

1. Airframe Check
1. General Inspection
2. Flight Deck
1. Exterior Surface Check
2. Visually inspect the booster, utility, auxilary, normal brake and emergency bake accumulations for correct air pressure.
1. Visually inspect Flight-Deck area and stow loose equipment
2. Clean and Visually Inspect Windows
3. Visually inspect the Cooling Turbine for proper oil level (inspect for specific level - sight gauge)

B Check – Airframe
Fuselage

1. Airframe Check
3. Fuselage
1. Visually inspect Cargo Compartment area and stow lose equipment
2. Visually inspect SAR Module
3. Visually Inspect Troop Seat and Litter Installation
4. Verify Plastic Seals on tool kit/flight engineer temporary repair kit (not broken)
5. Visually Inspect Fuselage Tank, Fuel Lines and Fittings for Condition and Security
6. Visually inspect Observer Seat for Condition and Security (& clean)
7. Check Fuselage Tank Surge Supressor for Correct Air Pressure
8. Visually inspect the cargo compartment air conditioning turbine for oil level /REcord level (only if problem)
9. Visually inspect the ATM installation /Record level and running time - get a ladder and climb up top
10. Visually inspect the utility and booster hydraulic reservoirs for proper fluid level /Record level
11. Ensure the NLG emergency lowering valve is witnessed wired in the normal position
12. Visually inspect the single point refueling (SPR) manifold surge suppressor for correct air charge. Replenish as required.

B Check – Airframe
Landing Gear and Wing

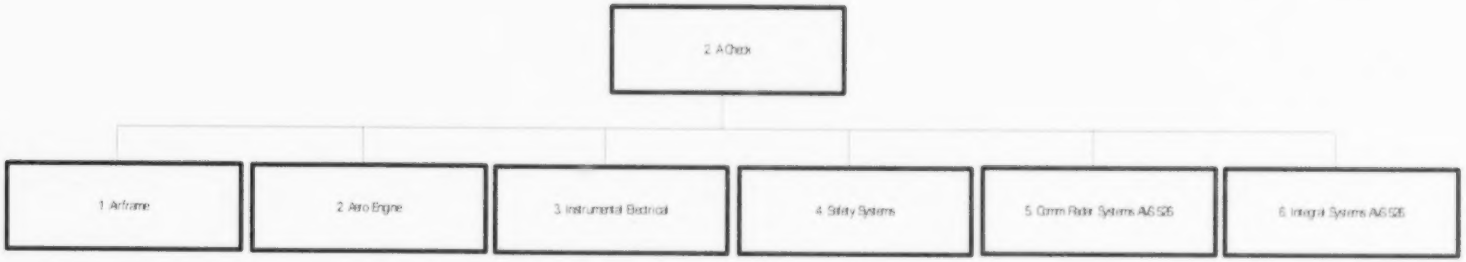

1. Airframe Check
4. Landing Gear
5. Wing
1. Visually inspect wheel well areas and landing gears, including torque struts and brake units. Ensure inspection windows are clean. Check the shock struts for proper extension
2. Visually inspect the main and nosewheel and tire assemblies for wear and cuts. Check tires for proper pressure and record the pressure
1. Visually inspect the No 1 - 4 centre dry bays for leaks
2. Visually inspect the LH and RH pods, pylons and attaching hardware
3. Check surge supressors for correct pressure (AAR pods LH & RH, and No 1 & No 4 dry bays)
4. Carry out condensate drain check


B Check
Aero Engine
2. Aero Engine
1. General
1. Check the fuel system for contamination at fuel tank drains and sumps prior to the first flight of the day. (engine tech duty - need to confirm)
2. Flight Deck
1. Fuel State (gauge readings) shall be entered (verify fuel quantity gauges with the press-to-test switch).
2. Ensure the fuel governor check switches are lock wired
3. Fuselage
1. Ensure the water detection kits are on board.
2. Visually inspect and replenish the spare fluid storage containers
4. Power Plants - conducted in parallel with other checks
1. Visually inspect the engine cowlings, doors and panels
2. Visually inspect the engine intake and air scoop areas
3. Visually inspect the engine exhausts and tail-pipe areas
5. Propellers - part of power plant check
1. Visually inspect the propellers and spinner assemblies

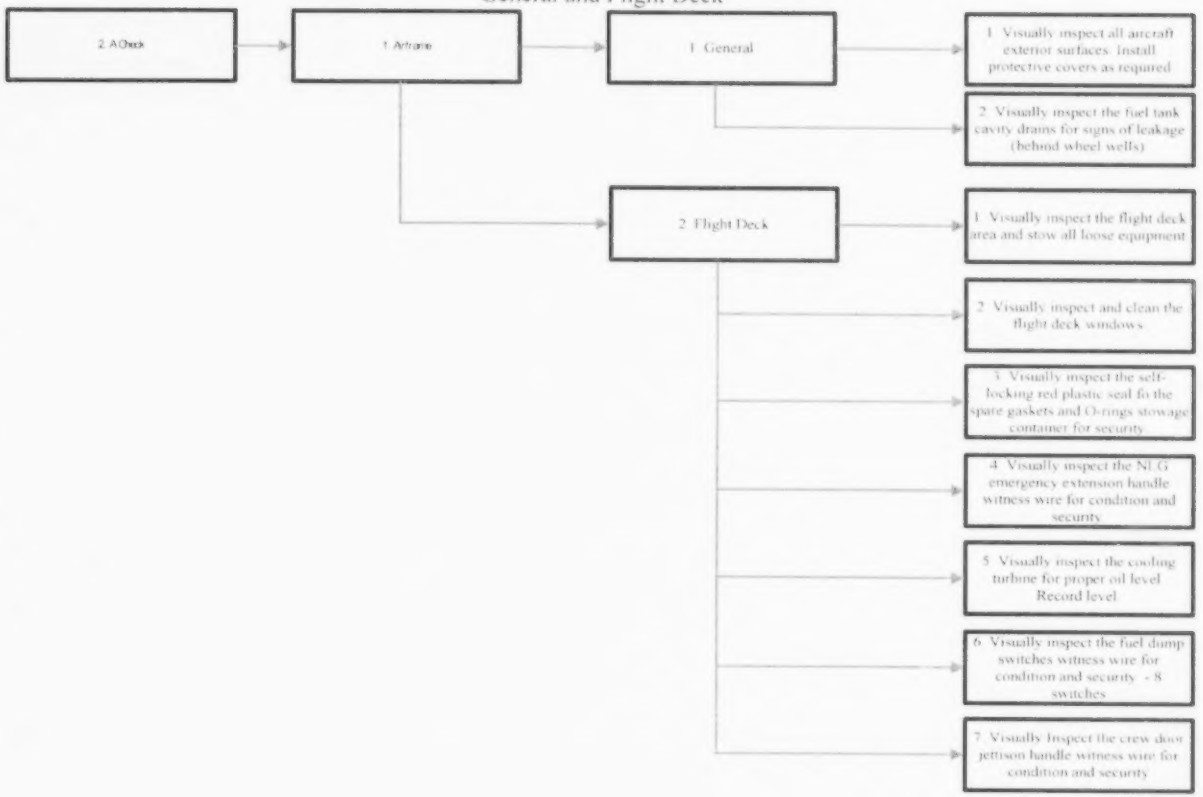
B Check
Instrument Electrical, Safety Systems and Comm Radar Systems

1. B Check
3. Instrument Electrical
1. Flight Deck
1. Check the aircraft battery voltage in accordance with proscribed readings.
4. Safety Systems
1. General
1. Check the liquid oxygen system quantity. Replenish as Required. Timing depends on carr (newer ones are much faster, slower on deployments)
2. Visually inspect the portable oxygen assemblies. Replenish as required.
3. Visually inspect the fire protection equipment.
4. Visually inspect the HALON 1211 portable fire extinguisher. Replace is necessary.
5. Visually inspect the survival kit equipment racks.
5. Comm Radar Systems
1. General
1. Visually Inspect and clean all AAR-47 sensor lenses while operating in missile threat areas or ale-47 cmds is loaded with chaff flares)

A Check Level 1



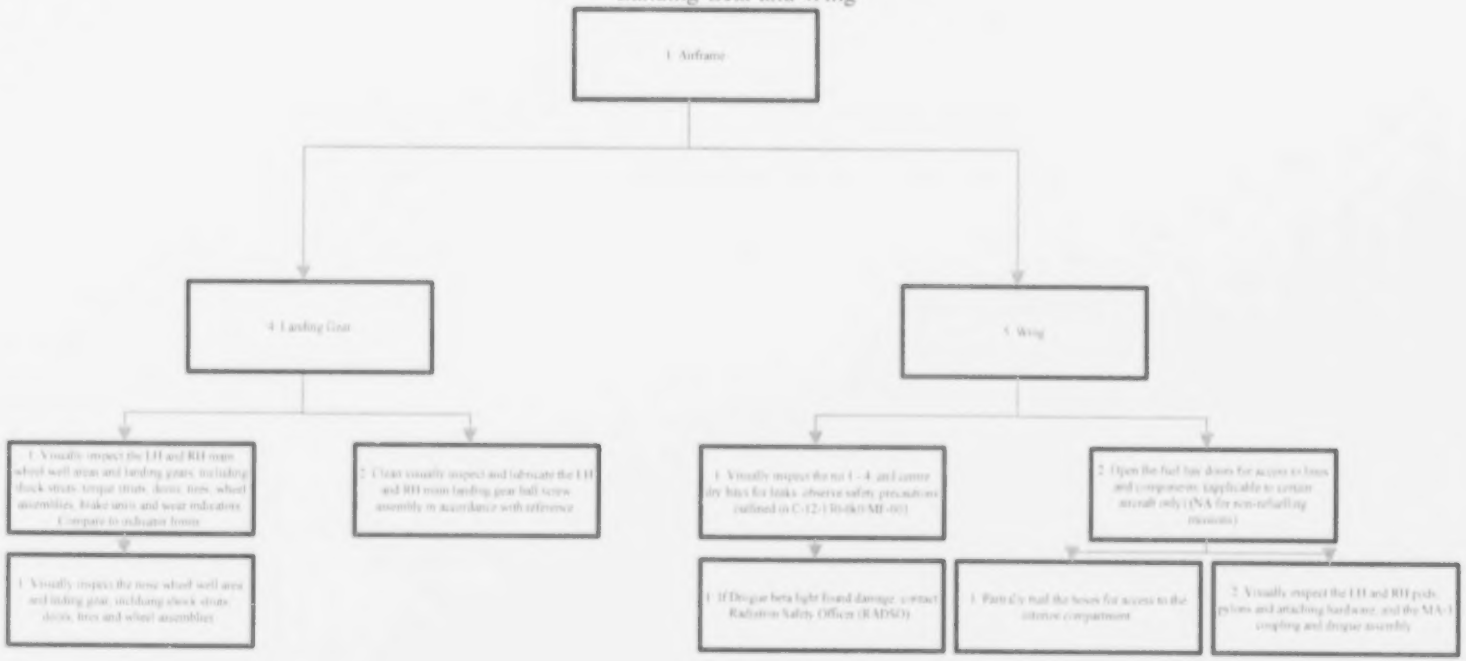
A Check – Airframe
General and Flight Deck


2 AOhck
1 Airframe
1 General
1 Visually inspect all aircraft exterior surfaces. Install protective covers as required
2 Visually inspect the fuel tank cavity drains for signs of leakage (behind wheel wells)
2 Flight Deck
1 Visually inspect the flight deck area and stow all loose equipment
2 Visually inspect and clean the flight deck windows
3 Visually inspect the self-locking red plastic seal fo the spare gaskets and O-rings stowage container for security
4 Visually inspect the NLG emergency extension handle witness wire for condition and security
5 Visually inspect the cooling turbine for proper oil level Record level
6 Visually inspect the fuel dump switches witness wire for condition and security - 8 switches
7 Visually Inspect the crew door jettison handle witness wire for condition and security

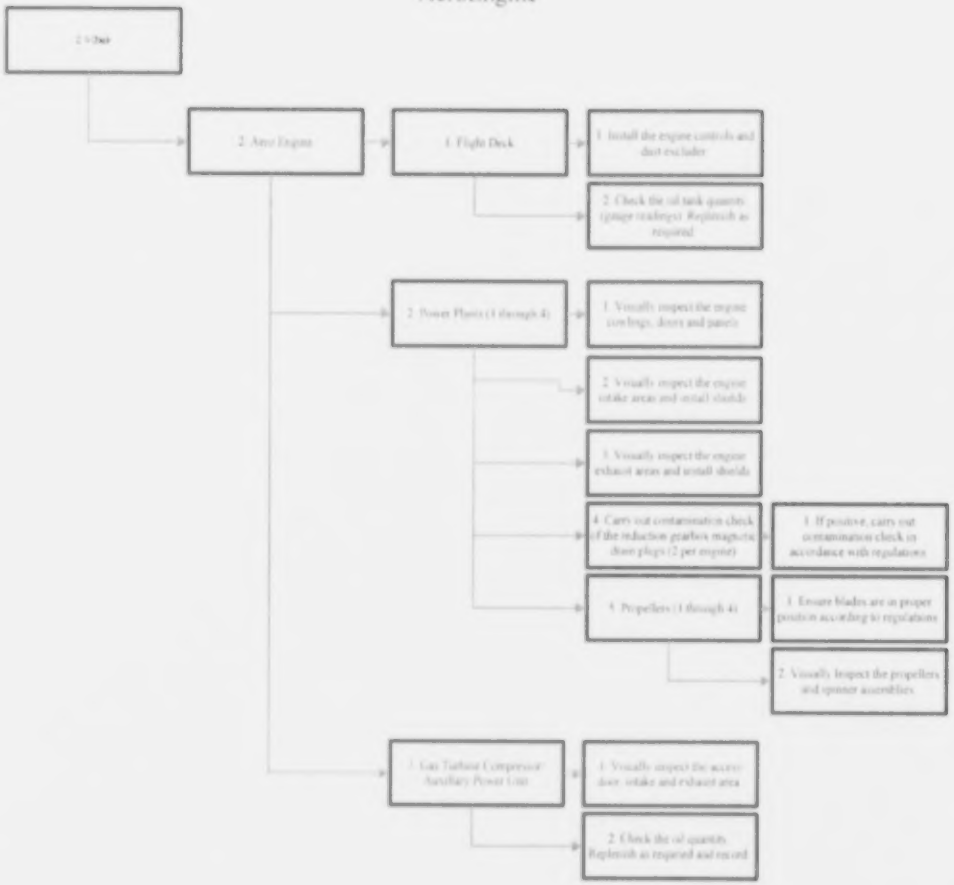
A Check – Airframe
Fuselage

4 Fuselage
1. Visually inspect and clean the fuselage windows as required.
2. Visually inspect the cargo compartment area. Pay particular attention to cleanliness.
3. Ensure that the crew door mechanism is lubricated.
4. Visually inspect the cargo handling system.
5. Check that the plastic seals at forward & aft bulkhead structure are in place. Ensure that the seals are not broken. Ensure that seals are not worn, cracked or torn.
6. Visually inspect the condition of the pressure armour around the galley, lavatory and toilets. Clean, repair as required.
7. Ensure aerials are in the fuselage stowed position. If fuselage is removed conduct a CF-105 aerial. Applicable to carbon fibre only.
8. Visually inspect the ACM installation. Record oil level and running time on CF-110.
9. Ensure the LAPES LON arm switch is fuselage in the off position.
10. Visually inspect the booster, utility, and auxiliary hydraulic reservoirs for proper fluid levels. Replenish as required.
11. Ensure filler caps are secure and overflow there are free of hydraulic fluid.
12. Visually inspect the booster, utility, and auxiliary hydraulic power systems for leaks.
13. Visually inspect the equipment installation, cargo compartment air conditioning turbine for correct oil levels. Record level.
14. Check the NDI manual for cargo compartment fire control are present. Replenish if required.
15. Visually inspect the fuselage tank (if installed). Ensure the ADS locks are properly engaged.
16. Visually inspect the fuselage tank fuel lines and fittings for condition and security.
17. Visually inspect the cargo door and ramp hydraulic actuator recesses and hydraulic lines.

A Check
Landing Gear and Wing

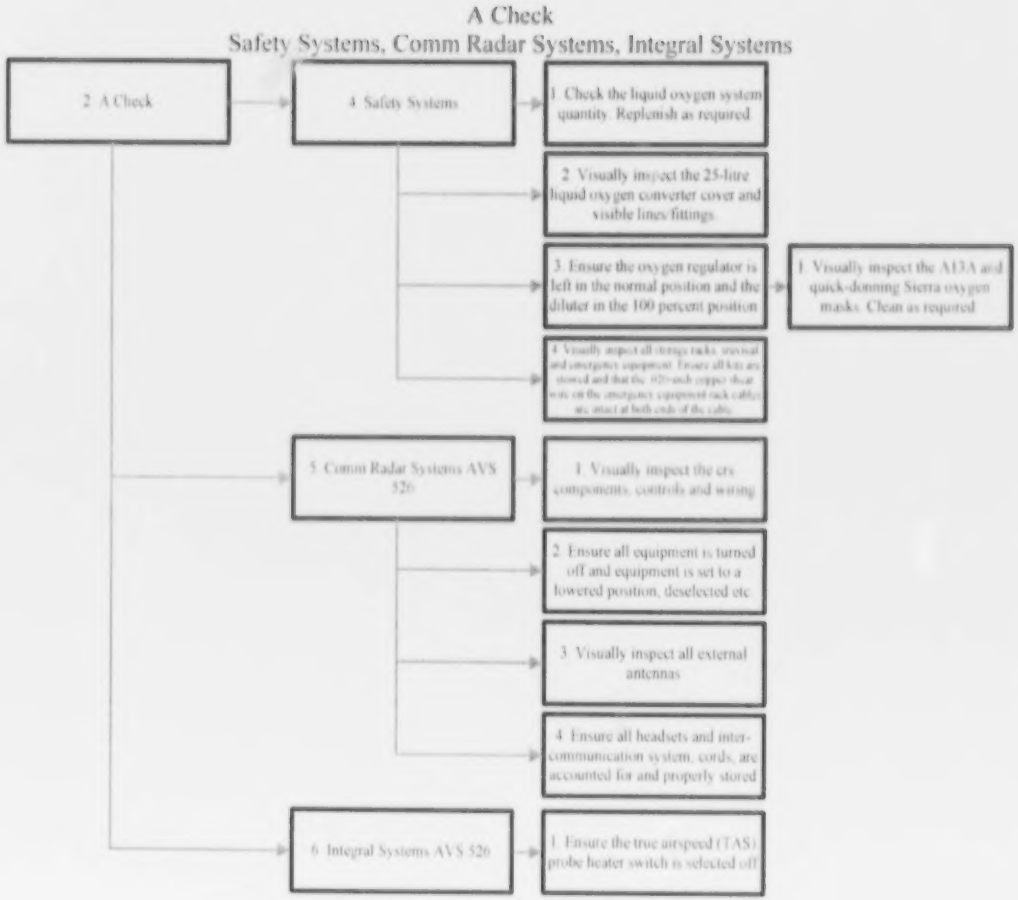

1. Airframe
4. Landing Gear
5. Wing
1. Visually inspect the LH and RH main wheel well areas and landing gears, including shock struts, torque struts, doors, tires, wheel assemblies, brake units and wear indicators. Compare to indicator limits
2. Clean visually inspect and lubricate the LH and RH main landing gear ball screw assembly in accordance with reference
1. Visually inspect the wet L - R and Centre dry bays for leaks, observe safety precautions outlined in C-12-130-000-ME-001
2. Open the fuel bay doors for access to lines and components. (applicable to certain aircraft only) (N/A for non-refuelling missions)
1. Visually inspect the nose wheel well area and landing gear, including shock struts, doors, tires and wheel assemblies
1. If Dregue beta light found damage, contact Radiation Safety Officer (RADSO)
1. Partially pull the hoses for access to the interior compartment
2. Visually inspect the LH and RH pods, pylons and attaching hardware, and the MA-3 coupling and dregue assembly

A Check
AeroEngine

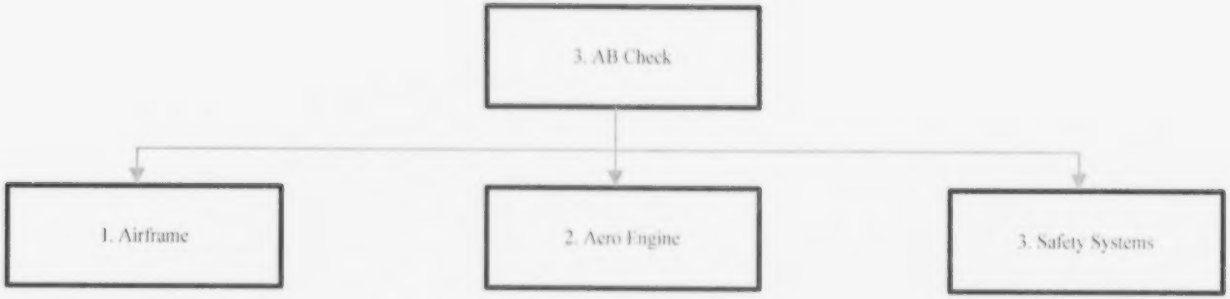

2. Aero Engine
1. Flight Deck
1. Install the engine controls and dust excluder
2. Check the oil tank quantity (gauge readings). Replenish as required
2. Power Plants (1 through 4)
1. Visually inspect the engine cowlings, doors and panels
2. Visually inspect the engine intake areas and install shields
3. Visually inspect the engine exhaust areas and install shields
4. Carry out contamination check of the reduction gearbox magnetic chips plugs (2 per engine)
1. If positive, carry out contamination check in accordance with regulations
5. Propellers (1 through 4)
1. Ensure blades are in proper position according to regulations
2. Visually Inspect the propellers and spinner assemblies
1. Gas Turbine Compressor Auxiliary Power Unit
1. Visually inspect the access door, intake and exhaust area
2. Check the oil quantity. Replenish as required and record

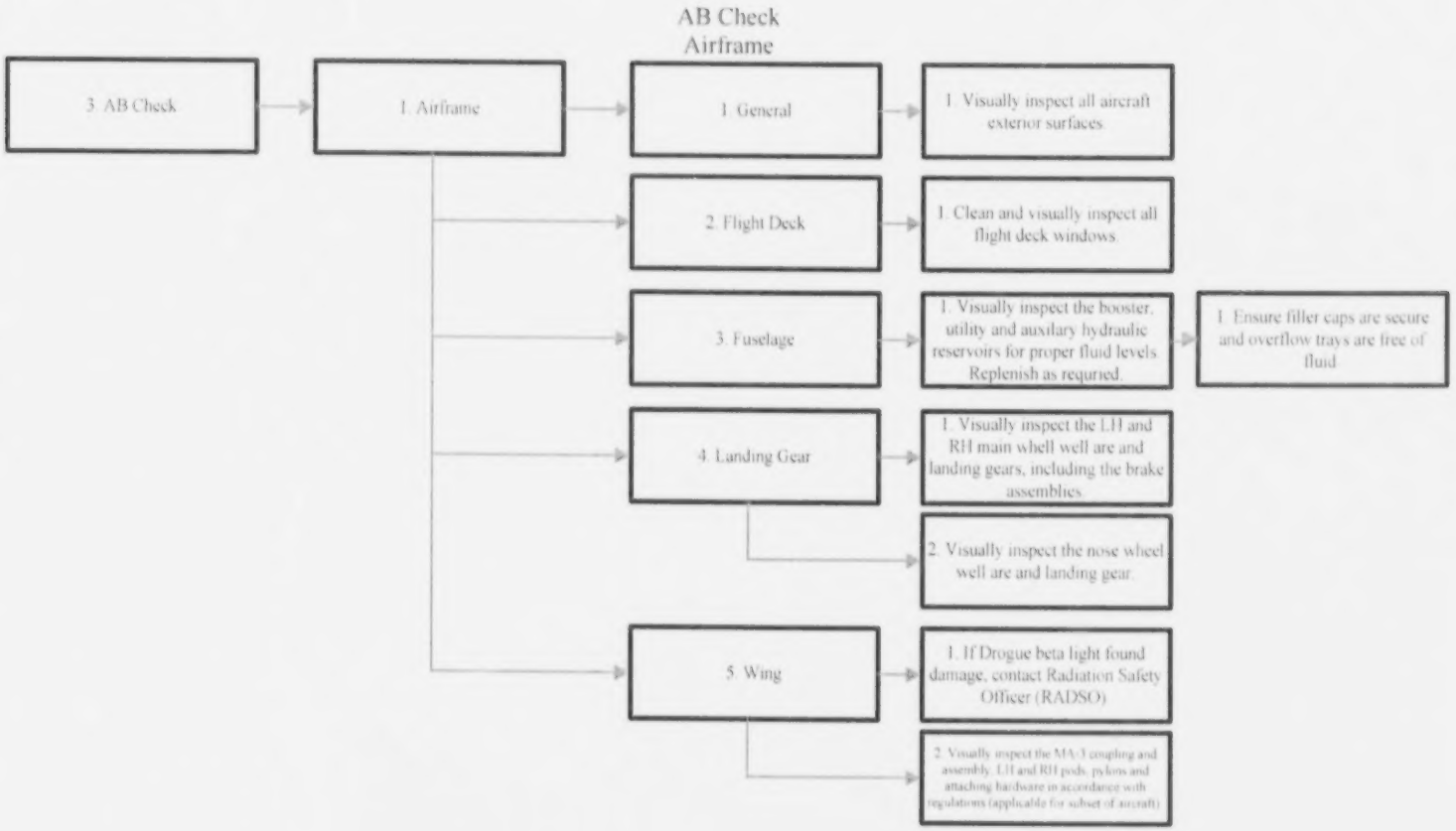
A Check
Instrument Electrical

2. A Check
3. Instrumental Electrical
1. General
1. Carry out an operational check of the interior and exterior lighting systems and replenish bulb box
2. Ensure the emergency exit light ejector handles are witness wired in accordance with regulations
3. Carry out a BITE check on aircraft returning from an air-to-air refuelling (AAR) mission
2. Flight Deck
1. Ensure there are 4 tagged circuit-breaker clips accounted for
3. Fuselage
1. Visually inspect the pitot heads and static vents for cleanliness. Install Covers
2. Visually inspect the battery sump jar and hoses. Pay particular attention for evidence of electrolyte leakage
3. Visually inspect the air to air refuelling system bondage tank wiring components and attaching hardware for condition and security
4. Wing
1. Carry out an operational check of the wing isolation valves in accordance with regulations (applicable for subset of aircraft)
2. Carry out and operational check of the wing divider valves in accordance with regulations (applicable for subset of aircraft)
3. Visually inspect the pod signal lamps for condition and security


A Check
Safety Systems, Comm Radar Systems, Integral Systems
2. A Check
4. Safety Systems
1. Check the liquid oxygen system quantity. Replenish as required.
2. Visually inspect the 25-litre liquid oxygen converter cover and visible lines/fittings.
3. Ensure the oxygen regulator is left in the normal position and the diluter in the 100 percent position.
1. Visually inspect the A13A and quick-donning Sierra oxygen masks. Clean as required.
4. Visually inspect all storage racks, survival and emergency equipment. Ensure all kits are stowed and that the #20-inch copper shear wire on the emergency equipment rack cables are intact at both ends of the cable.
5. Comm Radar Systems AVS 526
1. Visually inspect the crs components, controls and wiring.
2. Ensure all equipment is turned off and equipment is set to a lowered position, deselected etc.
3. Visually inspect all external antennas.
4. Ensure all headsets and inter-communication system, cords, are accounted for and properly stored.
6. Integral Systems AVS 526
1. Ensure the true airspeed (TAS) probe heater switch is selected off.

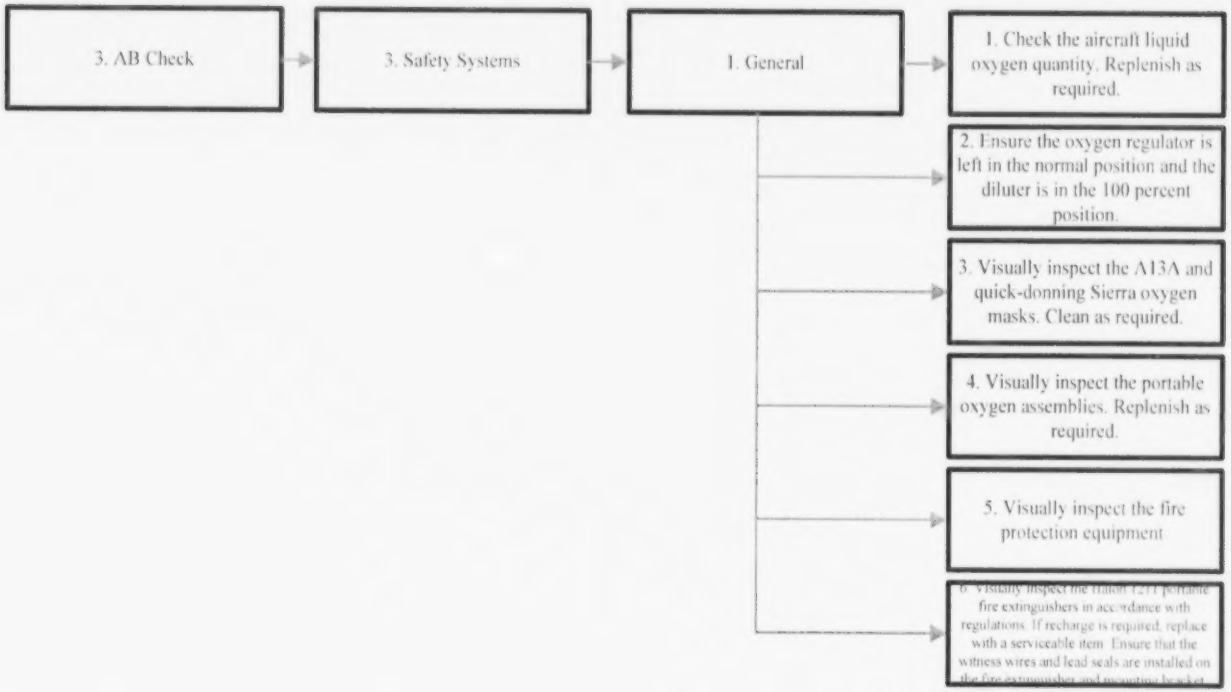
AB Check
High Level Functions



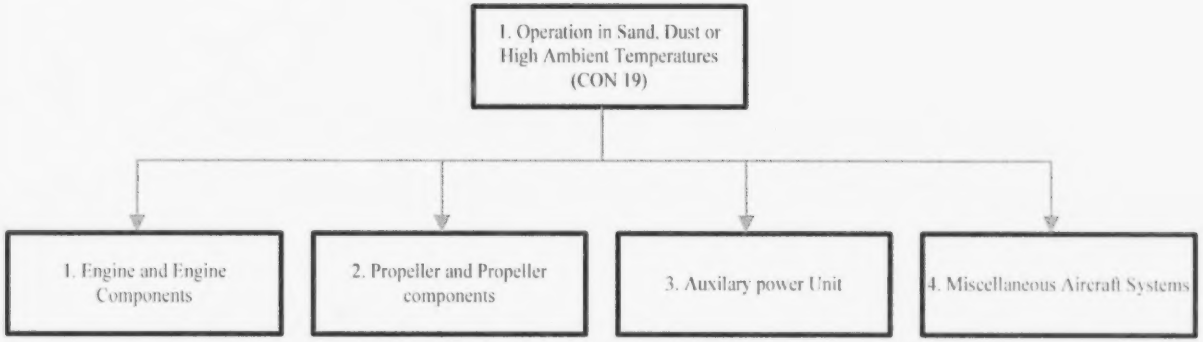

AB Check
Airframe
3. AB Check
1. Airframe
1. General
1. Visually inspect all aircraft exterior surfaces.
2. Flight Deck
1. Clean and visually inspect all flight deck windows.
3. Fuselage
1. Visually inspect the booster, utility and auxilary hydraulic reservoirs for proper fluid levels. Replenish as required.
1. Ensure filler caps are secure and overflow trays are free of fluid.
4. Landing Gear
1. Visually inspect the LH and RH main wheel well are and landing gears, including the brake assemblies.
2. Visually inspect the nose wheel well are and landing gear.
5. Wing
1. If Drogue beta light found damage, contact Radiation Safety Officer (RADSO)
2. Visually inspect the MA-3 coupling and assembly, LH and RH pods, pylons and attaching hardware in accordance with regulations (applicable for subset of aircraft)

AB Check
AeroEngine
3. AB Check
2. Aero Engine
1. Flight Deck
1. Check the oil tank quantity (gauge readings), replenish as required and record.
2. Check the fuel state (guage readings) and record.
1. Verify fuel quantity gauges with press-to-test switch.
2. Power Plants (1 through 4)
1. Visually inspect the engine cowlings, doors and panels.
2. Visually inspect the engine intake and air scoop areas.
3. Visually inspect the engine exhausts and tailpipe areas.
4. Visually inspect the lower pulley yoke assemblies for condition and security.
5. Propellers (1 through 4)
1. Visually inspect the propellers and spinner assemblies.

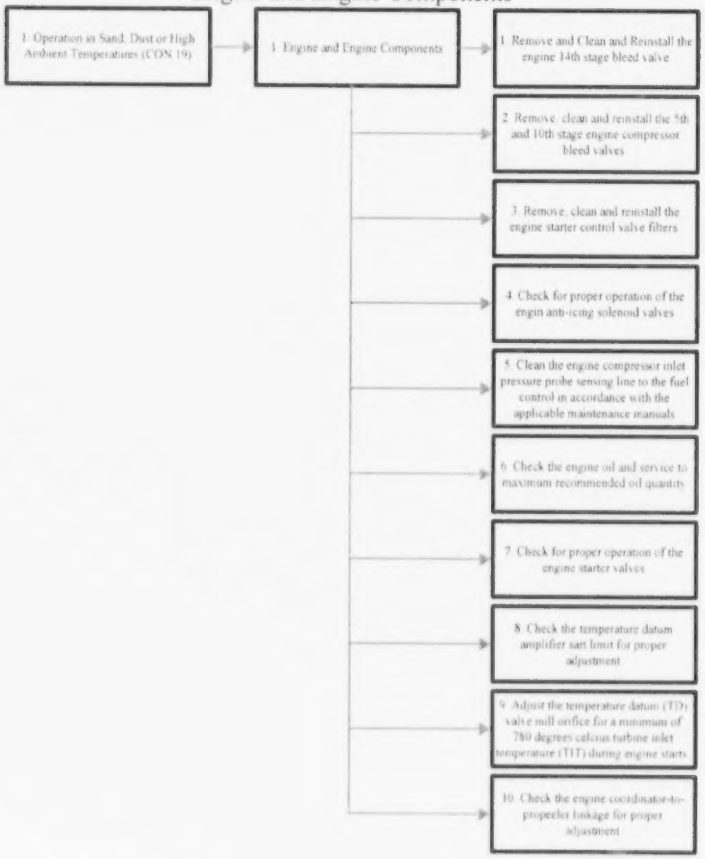
AB Check
Safety Systems


3. AB Check
3. Safety Systems
1. General
1. Check the aircraft liquid oxygen quantity. Replenish as required.
2. Ensure the oxygen regulator is left in the normal position and the diluter is in the 100 percent position.
3. Visually inspect the A13A and quick-donning Sierra oxygen masks. Clean as required.
4. Visually inspect the portable oxygen assemblies. Replenish as required.
5. Visually inspect the fire protection equipment
6. Visually inspect the Halon 1211 portable fire extinguishers in accordance with regulations. If recharge is required, replace with a serviceable item. Ensure that the witness wires and lead seals are installed on the fire extinguisher and mounting bracket

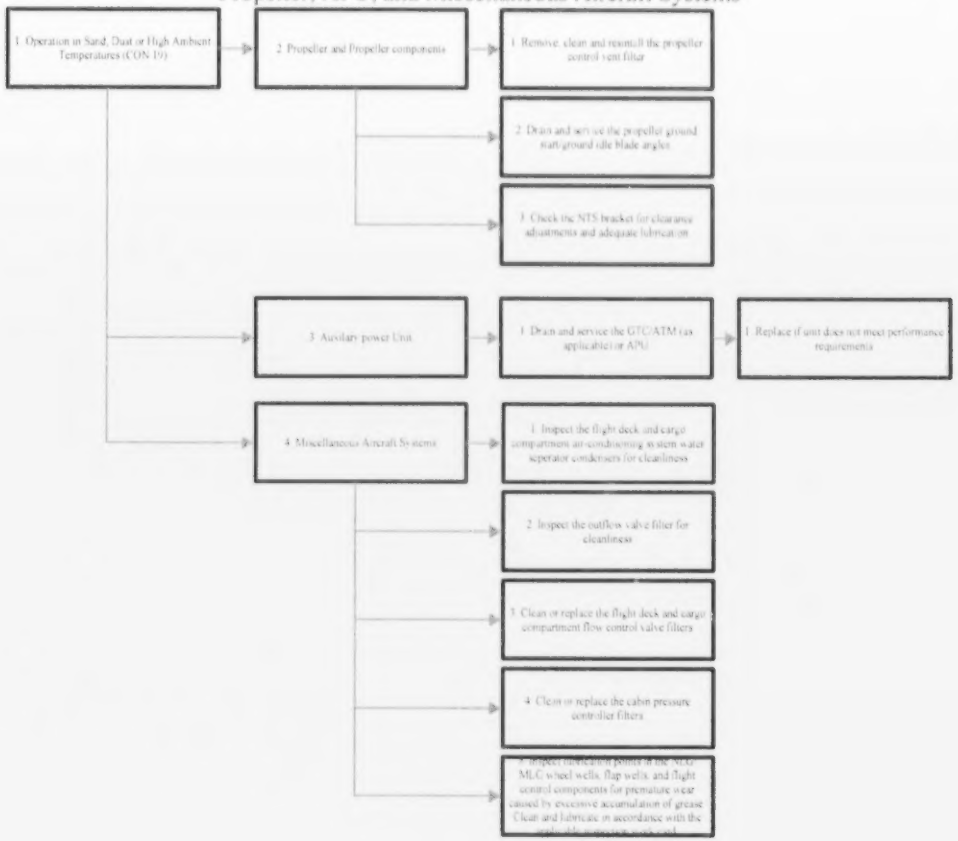
Conditional Inspection 19
Operation in Sand, Dust or High Ambient Temperatures


1. Operation in Sand, Dust or High Ambient Temperatures (CON 19)
1. Engine and Engine Components
2. Propeller and Propeller components
3. Auxilary power Unit
4. Miscellaneous Aircraft Systems

Condition Inspection 19
Operation in Sand, Dust or High Ambient Temperatures
Engine and Engine Components


1. Operation in Sand, Dust or High Ambient Temperatures (CON 19)
1. Engine and Engine Components
1. Remove and Clean and Reinstall the engine 14th stage bleed valve
2. Remove, clean and reinstall the 5th and 10th stage engine compressor bleed valves
3. Remove, clean and reinstall the engine starter control valve filters
4. Check for proper operation of the engin anti-icing solenoid valves
5. Clean the engine compressor inlet pressure probe sensing line to the fuel control in accordance with the applicable maintenance manuals
6. Check the engine oil and service to maximum recommended oil quantity
7. Check for proper operation of the engine starter valves
8. Check the temperature datum amplifier sart limit for proper adjustment
9. Adjust the temperature datum (TD) valve mill orifice for a minimum of 780 degrees celcius turbine inlet temperature (TIT) during engine starts
10. Check the engine coordinator-to-propeeler linkage for proper adjustment

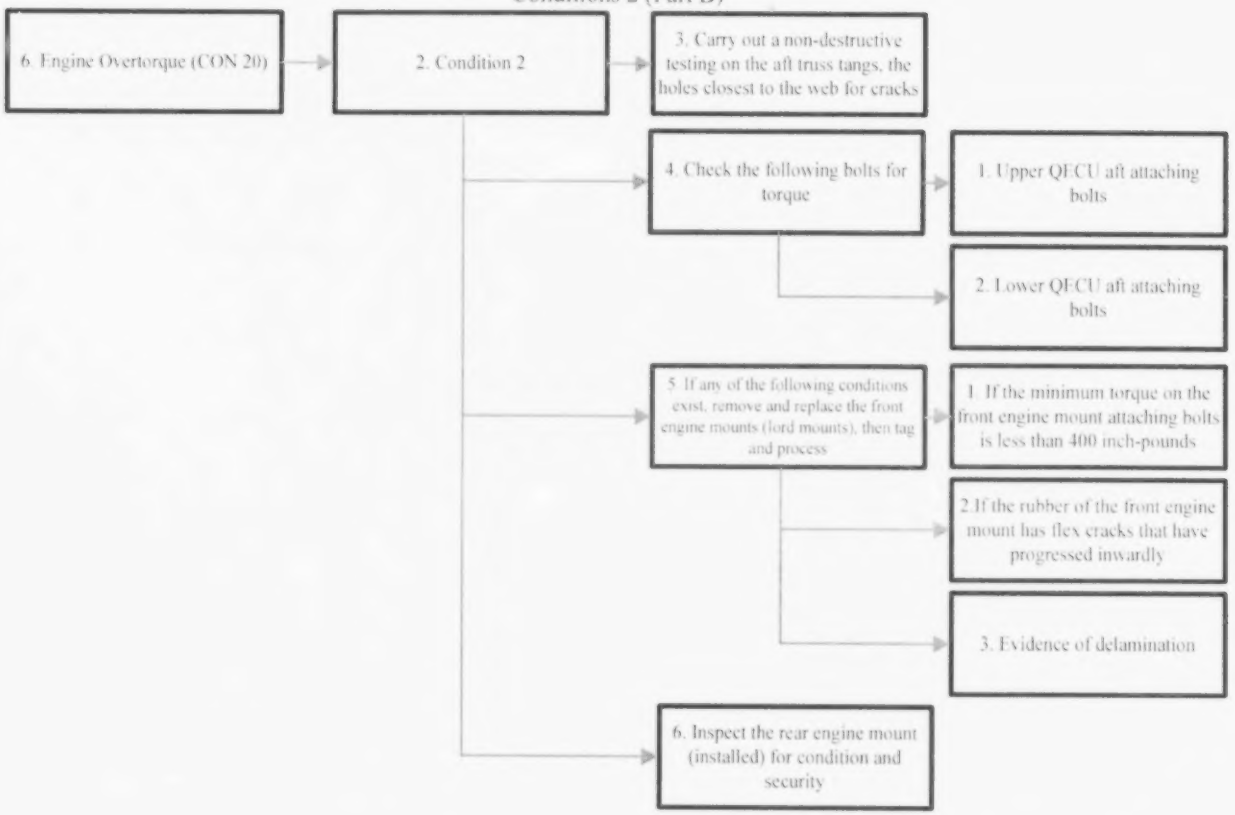
Condition Inspection 19
Operation in Sand, Dust or High Ambient Temperatures
Propeller, APU, and Miscellaneous Aircraft Systems


1. Operation in Sand, Dust or High Ambient Temperatures (CON 19)
2. Propeller and Propeller components
1. Remove, clean and reinstall the propeller control vent filter
2. Drain and service the propeller ground staff/ground idle blade angles
3. Check the NTS bracket for clearance adjustments and adequate lubrication
3. Auxiliary power Unit
1. Drain and service the GTC/ATM (as applicable) or APU
1. Replace if unit does not meet performance requirements
4. Miscellaneous Aircraft Systems
1. Inspect the flight deck and cargo compartment air-conditioning system water seperator condensers for cleanliness
2. Inspect the outflow valve filter for cleanliness
3. Clean or replace the flight deck and cargo compartment flow control valve filters
4. Clean or replace the cabin pressure controller filters
MLG wheel wells, flap wells, and flight control components for premature wear caused by excessive accumulation of grease. Clean and lubricate in accordance with the

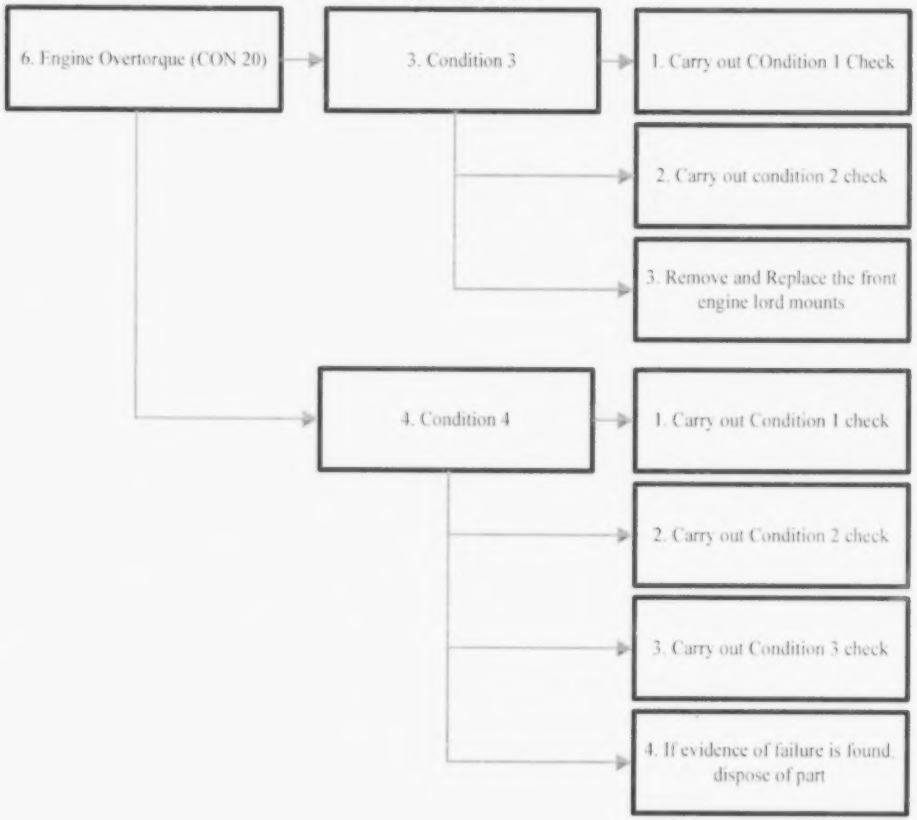
Conditional Inspection 20
Engine Overtorque
Conditions 1 & 2 (Part A)

1. Engine Overtorque (CON 20)
1. Condition 1
1. Visually inspect the QECU and aft nacelle cowling, skins and doors for wrinkles, buckling and loose missing or pulled fasteners
2. Condition 2
1. Carry Out Condition 1 Inspection
2. Using a flashlight and mirror, visually inspect the following areas
1. Without removing the fire shields, visually inspect the QECU upper and lower longerons for cracks and the fasteners attaching the fire wall to the upper longerons for loose or missing fasteners
1. Visually inspect the QECU centre mount beam for cracks
2. Inspect the QECU diagonal brace for cracks
3. Inspect the disconnect fittings in the aft end of the QECU for cracks, alignment and security
2. Inspect the aft truss longeron diagonal lugs and diagonal brace bolts and attachment to the front beam for cracks and loose and missing fasteners
3. Inspect the aft truss upper tangs (truss wing rib fitting) (inside dry bay) and bolts for cracks
4. Inspect the centre wing and outer wing upper engine truss fittings to the rib/former attachment fitting and former for cracks
5. Inspect the drag angle (aft truss wing lower surface) and nacelle for cracks and loose or missing fasteners
6. Inspect the entire rib assembly and installation inside the dry bays at CWS 178 and former installations at CWS 213, OWS 163 and OWS 197
7. Inspect the wing forward beam web and fasteners between CWS 178 and CWS 220 and between OWS 162 and OWS 197
8. Inspect the upper and lower wing panels between CWS 160 and CWS 220, and between OWS 144 and OWS 214
9. Inspect the engine power section and reduction gearbox magnetic oil drain plugs for contamination
10. Inspect the engine power section and reduction gearbox oil filters for contamination

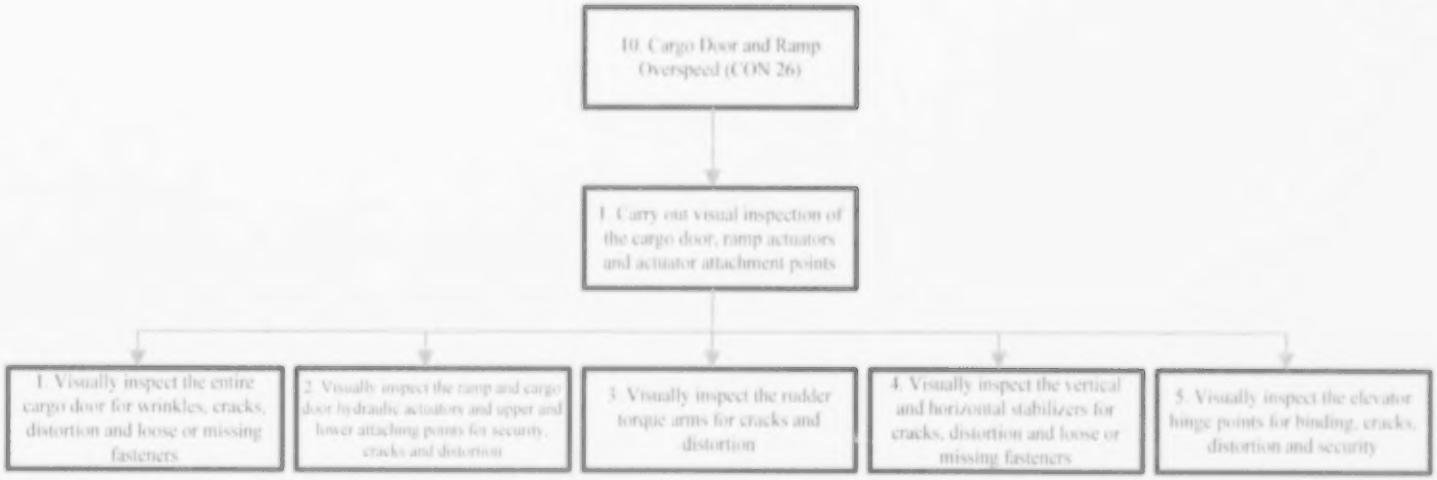
Conditional Inspection 20
Engine Overtorque
Conditions 2 (Part B)


6. Engine Overtorque (CON 20)
2. Condition 2
3. Carry out a non-destructive testing on the aft truss tangs, the holes closest to the web for cracks
4. Check the following bolts for torque
1. Upper QECU aft attaching bolts
2. Lower QECU aft attaching bolts
5. If any of the following conditions exist, remove and replace the front engine mounts (lord mounts), then tag and process
1. If the minimum torque on the front engine mount attaching bolts is less than 400 inch-pounds
2.If the rubber of the front engine mount has flex cracks that have progressed inwardly
3. Evidence of delamination
6. Inspect the rear engine mount (installed) for condition and security

Conditional Inspection 20
Engine Overtorque
Conditions 3 & 4


6. Engine Overtorque (CON 20)
3. Condition 3
1. Carry out COndition 1 Check
2. Carry out condition 2 check
3. Remove and Replace the front engine lord mounts
4. Condition 4
1. Carry out Condition 1 check
2. Carry out Condition 2 check
3. Carry out Condition 3 check
4. If evidence of failure is found dispose of part

Cargo Door and Ramp Overspeed


10. Cargo Door and Ramp Overspeed (CON 26)
1. Carry out visual inspection of the cargo door, ramp actuators and actuator attachment points
1. Visually inspect the entire cargo door for wrinkles, cracks, distortion and loose or missing fasteners
2. Visually inspect the ramp and cargo door hydraulic actuators and upper and lower attaching points for security, cracks and distortion
3. Visually inspect the rudder torque arms for cracks and distortion
4. Visually inspect the vertical and horizontal stabilizers for cracks, distortion and loose or missing fasteners
5. Visually inspect the elevator hinge points for binding, cracks, distortion and security

Annex C – Function / Task Tables

Task	time	Notes	Visual Component	Cognitive Component	Task Requirement	Work Intensities	Operator Allocation
Short-Term Checks							
1 B Check							
1.1 Airframe Check							
1.1.1 General Inspection							
1.1.1.1 Exterior Surface Check	15 min		4 Inspect/Check (Discrete Inspection)	6.8 Evaluation/Judgement (Consider Several Aspects)	Deployment, Main Operating Base (MOB)	Low	AVN Tech
1.1.1.2 Visually inspect the booster, utility, auxiliary, normal brake and emergency bake accumulations for correct air pressure.	1 min		4 Inspect/Check (Discrete Inspection)	4.6 Evaluation/Judgement (Single Aspect)	Deployment, Main Operating Base (MOB)	Low	AVN Tech
1.1.2 Flight Deck							
1.1.2.1 Visually inspect Flight-Deck area and stow loose equipment	5 min		4 Inspect/Check (Discrete Inspection)	1 Automatic (Simple Association)	Deployment, Main Operating Base (MOB)	Low	AVN Tech
1.1.2.2 Clean and Visually Inspect Windows	5 min		4 Inspect/Check (Discrete Inspection)	6.8 Evaluation/Judgement (Consider Several Aspects)	Deployment, Main Operating Base (MOB)	Low	AVN Tech
1.1.2.3 Visually inspect the Cooling Turbine for proper oil level (inspect for specific level - sight gauge)	15 sec		5.9 Read (Symbol)	4.6 Evaluation/Judgement (Single Aspect)	Deployment, Main Operating Base (MOB)	Low	AVN Tech

1.1.3 Fuselage							
1.1.3.1 Visually inspect Cargo Compartment area and stow lose equipment	15 min		4 Inspect/Check (Discrete Inspection)	1 Automatic (Simple Association)	Deployment, Main Operating Base (MOB)	Low	AVN Tech
1.1.3.2 Visually inspect SAR Module		No Data – only specific airframes	4 Inspect/Check (Discrete Inspection)	6.8 Evaluation/Judgement (Consider Several Aspects)	Main Operating Base (MOB)	Low	AVN Tech
1.1.3.3 Visually Inspect Troop Seet and Litter Installation	2 min		4 Inspect/Check (Discrete Inspection)	4.6 Evaluation/Judgement (Single Aspect)	Deployment, Main Operating Base (MOB)	Low	AVN Tech
1.1.3.4 Verify Plastic Seals on tool kits/flight engineer temporary repair kit (not broken)	5 sec		4 Inspect/Check (Discrete Inspection)	4.6 Evaluation/Judgement (Single Aspect)	Deployment, Main Operating Base (MOB)	Low	AVN Tech
1.1.3.5 Visually Inspect Fuselage Tank, Fuel Lines and Fittings for Condition and Security	30 sec		4 Inspect/Check (Discrete Inspection)	6.8 Evaluation/Judgement (Consider Several Aspects)	Deployment, Main Operating Base (MOB)	Low	AVN Tech
1.1.3.6 Visually inspect Observer Seat for Condition and Security (& clean)			4 Inspect/Check (Discrete Inspection)	6.8 Evaluation/Judgement (Consider Several Aspects)	Main Operating Base (MOB)	Low	AVN Tech
1.1.3.7 Check Fuselage Tank Surge Suppressor for Correct Air Pressure			5.9 Read (Symbol)	4.6 Evaluation/Judgement (Single Aspect)	Main Operating Base (MOB)	Low	AVN Tech
1.1.3.8 Visually	5 sec		5.9 Read	4.6	Deployment,	Low	AVN Tech

inspect the cargo compartment air conditioning turbine for oil level. Record level (only if problem)		(Symbol)	Evaluation/Judgement (Single Aspect)	Main Operating Base (MOB)		
1.1.3.9 Visually inspect the ATM installation. Record level. and running time. - get a ladder and climb up top.	45 sec	5.9 Read (Symbol)	6.8 Evaluation/Judgement (Consider Several Aspects)	Deployment, Main Operating Base (MOB)	Low	AVN Tech
1.1.3.10 Visually inspect the utility and booster hydraulic reservoirs for proper fluid level. Record level.	30 sec.	5.9 Read (Symbol)	4.6 Evaluation/Judgement (Single Aspect)	Deployment, Main Operating Base (MOB)	Low	AVN Tech
1.1.3.11 Ensure the NLG emergency lowering valve is witnessed wired in the normal position.	3 sec.	4 Inspect/Check (Discrete Inspection)	4.6 Evaluation/Judgement (Single Aspect)	Deployment, Main Operating Base (MOB)	Low	AVN Tech
1.1.3.12 Visually inspect the single point refuelling (SPR) manifold surge suppressor for correct air charge. Replenish as required.	5 sec	5.9 Read (Symbol)	4.6 Evaluation/Judgement (Single Aspect)	Deployment, Main Operating Base (MOB)	Low	AVN Tech
1.1.4 Landing Gear						
1.1.4.1 Visually inspect wheel well areas and landing gears, including torque struts and	5 min	4 Inspect/Check (Discrete Inspection)	6.8 Evaluation/Judgement (Consider Several Aspects)	Deployment, Main Operating Base (MOB)	Low	AVN Tech

brake units. Ensure inspection windows are clean. Check the shock struts for proper extension.						
1.1.4.2 Visually inspect the amin and nosewheel and tire assemblies for wear and cuts. Check tires for proper pressure and record the pressure.	3 min	5.9 Read (Symbol)	6.8 Evaluation/Judgement (Consider Several Aspects)	Deployment, Main Operating Base (MOB)	Low	AVN Tech
1.1.5 Wing						
1.1.5.1 Visually inspect the n1 - 4 centre dry bays for leaks	2 min	4 Inspect/Check (Discrete Inspection)	4.6 Evaluation/Judgement (Single Aspect)	Deployment, Main Operating Base (MOB)	Low	AVN Tech
1.1.5.2 Visually inspect the LH and RH pods, pylons and attaching hardware.	air-to-air refuelling only	4 Inspect/Check (Discrete Inspection)	4.6 Evaluation/Judgement (Single Aspect)	Air-to-Air Refuelling	Low	AVN Tech
1.1.5.3 Check surge suppressors for correct pressure (AAR pods LH & RH, and No 1 & No 4 dry bays)	air-to-air	5.9 Read (Symbol)	4.6 Evaluation/Judgement (Single Aspect)	Air-to-Air Refuelling	Low	AVN Tech
1.1.5.4 Carry out condensate drain check.	10 min	4 Inspect/Check (Discrete Inspection)	4.6 Evaluation/Judgement (Single Aspect)	Deployment, Main Operating Base (MOB)		AVN Tech
1.2 Aero Engine						
1.2.1 General						
1.2.1.1 Check the fuel system for		4 Inspect/Check	4.6 Evaluation/Judgement	Deployment, Main	Low	AVN Tech

contamination at fuel tank drains and sumps prior to the first flight of the day. (engine tech duty - need to confirm)			(Discrete Inspection)	(Single Aspect)	Operating Base (MOB)		
1.2.2 Flight Deck							AVN Tech
1.2.2.1 Fuel State (gauge readings) shall be entered (verify fuel quantity gauges with the press-to-test switch)	2 min		5.9 Read (Symbol)	4.6 Evaluation/Judgement (Single Aspect)	Deployment, Main Operating Base (MOB)	Very Low	AVN Tech
1.2.2.2 Ensure the fuel governor check switches are lock wired.	5 sec		4 Inspect/Check (Discrete Inspection)	4.6 Evaluation/Judgement (Single Aspect)	Deployment, Main Operating Base (MOB)	Low	AVN Tech
1.2.3 Fuselage							
1.2.3.1 Ensure the water detection kits are on board.	5 sec		4 Inspect/Check (Discrete Inspection)	1 Automatic (Simple Association)	Deployment, Main Operating Base (MOB)	Very Low	AVN Tech
1.2.3.2 Visually inspect and replenish the spare fluid storage containers	30 sec, 5 - 10 min to replenish		4 Inspect/Check (Discrete Inspection)	4.6 Evaluation/Judgement (Single Aspect)	Deployment, Main Operating Base (MOB)	Low	AVN Tech
1.2.4 Power Plants - conducted in parallel with other checks	45 min total (includes all tasks listed below)						
1.2.4.1 Visually inspect the engine cowlings, doors and			4 Inspect/Check (Discrete	4.6 Evaluation/Judgement (Single Aspect)	Deployment, Main Operating	Low	AVN Tech

panels.		Inspection)		Base (MOB)		
1.2.4.2 Visually inspect the engine intake and air scoop areas.		4 Inspect/Check (Discrete Inspection)	4.6 Evaluation/Judgement (Single Aspect)	Deployment, Main Operating Base (MOB)	Low	AVN Tech
1.2.4.3 Visually inspect the engine exhausts and tail-pipe areas.		4 Inspect/Check (Discrete Inspection)	4.6 Evaluation/Judgement (Single Aspect)	Deployment, Main Operating Base (MOB)	Low	AVN Tech
1.2.5 Propellers - part of power plant check						
1.2.5.1 Visually inspect the propellers and spinner assemblies.		4 Inspect/Check (Discrete Inspection)	4.6 Evaluation/Judgement (Single Aspect)	Deployment, Main Operating Base (MOB)	Low	AVN Tech
1.3 Instrument Electrical						
1.3.1 Flight Deck						
1.3.1.1 Check the aircraft battery voltage in accordance with proscribed readings.	15 sec	5.9 Read (Symbol)	4.6 Evaluation/Judgement (Single Aspect)	Deployment, Main Operating Base (MOB)	Very Low	AVN Tech
1.4 Safety Systems						
1.4.1 General						
1.4.1.1 Check the liquid oxygen system quantity. Replenish as Required. Timing depends on cart (newer ones are much faster, slower on deployments)	5 sec, replenish 1.5 hr	4 Inspect/Check (Discrete Inspection)	4.6 Evaluation/Judgement (Single Aspect)	Deployment, Main Operating Base (MOB)	Low	AVN Tech

1.4.1.2 Visually inspect the portable oxygen assemblies. Replenish as Required	20 sec. 1 - 2 min	4 Inspect/Check (Discrete Inspection)	4.6 Evaluation/Judgement (Single Aspect)	Deployment, Main Operating Base (MOB)	Low	AVN Tech
1.4.1.3 Visually inspect the fire protection equipment.	1 min	4 Inspect/Check (Discrete Inspection)	4.6 Evaluation/Judgement (Single Aspect)	Deployment, Main Operating Base (MOB)	Low	AVN Tech
1.4.1.4 Visually inspect the HALON 1211 portable fire extinguisher. Replace is necessary.	5 sec	4 Inspect/Check (Discrete Inspection)	4.6 Evaluation/Judgement (Single Aspect)	Deployment, Main Operating Base (MOB)	Low	AVN Tech
1.4.1.5 Visually inspect the survival kit equipment racks.	15 sec	4 Inspect/Check (Discrete Inspection)	4.6 Evaluation/Judgement (Single Aspect)	Deployment, Main Operating Base (MOB)	Low	AVN Tech
1.5 Comm Radar Systems						
1.5.1 General						
1.5.1.1 Visually Inspect and clean all AAR-47 sensor lenses while operating in missile threat areas or ale-47 cmds is loaded with chaff/flares)	10 min	4 Inspect/Check (Discrete Inspection)	4.6 Evaluation/Judgement (Single Aspect)	Deployment	Low	AVS Tech
2 A Check						
2.1 Airframe						
2.1.1 General						
2.1.1.1 Visually inspect all aircraft	45 - 1hr.	4 Inspect/Check	6.8 Evaluation/Judgement	Deployment, Main	Low	AVN Tech

exterior surfaces. Install protective covers as required		(Discrete Inspection)	(Consider Several Aspects)	Operating Base (MOB)		
2.1.1.2 Visually inspect the fuel tank cavity drains for signs of leakage (behind wheel wells).	1 min	4 Inspect/Check (Discrete Inspection)	6.8 Evaluation/Judgement (Consider Several Aspects)	Deployment, Main Operating Base (MOB)	Low	AVN Tech
2.1.2 Flight Deck						
2.1.2.1 Visually inspect the flight deck area and stow all loose equipment.	5 - 10 min	4 Inspect/Check (Discrete Inspection)	4.6 Evaluation/Judgement (Single Aspect)	Deployment, Main Operating Base (MOB)	Low	AVN Tech
2.1.2.2 Visually inspect and clean the flight deck windows.	5 min	4 Inspect/Check (Discrete Inspection)	4.6 Evaluation/Judgement (Single Aspect)	Deployment, Main Operating Base (MOB)	Low	AVN Tech
2.1.2.3 Visually inspect the self-locking red plastic seal of the spare gaskets and O-rings stowage container for security.	5 sec	4 Inspect/Check (Discrete Inspection)	4.6 Evaluation/Judgement (Single Aspect)	Deployment, Main Operating Base (MOB)	Low	AVN Tech
2.1.2.4 Visually inspect the NLG emergency extension handle witness wire for condition and security.	5 sec	4 Inspect/Check (Discrete Inspection)	4.6 Evaluation/Judgement (Single Aspect)	Deployment, Main Operating Base (MOB)	Very Low	AVN Tech
2.1.2.5 Visually inspect the cooling turbine for proper oil level. Record level.	5 sec	5.9 Read (Symbol)	3.7 Sign/Signal Recognition	Deployment, Main Operating Base (MOB)	Very Low	AVN Tech

2.1.2.6 Visually inspect the fuel dump switches witness wire for condition and security. - 8 switches	5 sec (10 min to wire all up completely)	**confirm if air-to-air	4 Inspect/Check (Discrete Inspection)	4.6 Evaluation/Judgement (Single Aspect)	Deployment, Main Operating Base (MOB)	Very Low	AVN Tech
2.1.2.7 Visually Inspect the crew door jettison handle witness wire for condition and security	3 sec		4 Inspect/Check (Discrete Inspection)	4.6 Evaluation/Judgement (Single Aspect)	Deployment, Main Operating Base (MOB)	Very Low	AVN Tech
2.1.3 Fuselage							
2.1.3.1 Visually inspect and clean the fuselage windows as required	5 min		4 Inspect/Check (Discrete Inspection)	4.6 Evaluation/Judgement (Single Aspect)	Deployment, Main Operating Base (MOB)	Low	AVN Tech
2.1.3.2 Visually Inspect the cargo compartment area. Pay particular attention to cleanliness.	10 min - 1hr		4 Inspect/Check (Discrete Inspection)	4.6 Evaluation/Judgement (Single Aspect)	Deployment, Main Operating Base (MOB)	Low	AVN Tech
2.1.3.3 Ensure that the crew door mechanism yoke has not rotated.	10 sec		4 Inspect/Check (Discrete Inspection)	3.7 Sign/Signal Recognition	Deployment, Main Operating Base (MOB)	Very Low	AVN Tech
2.1.3.4 Visually Inspect the cargo handling system.	20 sec, 10 - 20 min if lock cleaning required		4 Inspect/Check (Discrete Inspection)	4.6 Evaluation/Judgement (Single Aspect)	Deployment, Main Operating Base (MOB)	Low	AVN Tech
2.1.3.5 Verify that the plastic seals on the tool kit/flight engineer temporary	30sec	plastic seals on toolkits - 3 different toolkits, main	5.9 Read (Symbol)	4.6 Evaluation/Judgement (Single Aspect)	Deployment, Main Operating Base (MOB)	Very Low	AVN Tech

repair kit are not broken. Record the seal serial number on CF335.		landing gear tie-down locking devices X 2 (1 min for al five)					
2.1.3.6 Visually inspect the corrosion-prone areas around the galley, urinals and toilets. Cleans areas as required.	2 min (clean 5 min)		4 Inspect/Check (Discrete Inspection)	4.6 Evaluation/Judgement (Single Aspect)	Deployment, Main Operating Base (MOB)	Low	AVN Tech
2.1.3.7 Ensure urinals are in the lockwired position. If lockwire is removed conduct a CF349 entry. (Applicable to certain aircraft)	30 sec		4 Inspect/Check (Discrete Inspection)	4.6 Evaluation/Judgement (Single Aspect)	Deployment, Main Operating Base (MOB)	Very Low	AVN Tech
2.1.3.8 Visually inspect the ATM installation. Record oil level and running time on CF335.	2 min		5.9 Read (Symbol)	4.6 Evaluation/Judgement (Single Aspect)	Deployment, Main Operating Base (MOB)	Very Low	AVN Tech
2.1.3.9 Ensure the LAPES/CDS arm switch is lockwired in the off position.	30 sec	low altitude pallet extraction system	4 Inspect/Check (Discrete Inspection)	4.6 Evaluation/Judgement (Single Aspect)	Deployment, Main Operating Base (MOB)	Very Low	AVN Tech
2.1.3.10 Visually inspect the booster, utility, and auxiliary hydraulic reservoirs for proper fluid levels. Replenish as required.	5 - 6 min	open up utility panels (butterfly or screwdriver latches)	4 Inspect/Check (Discrete Inspection)	4.6 Evaluation/Judgement (Single Aspect)	Deployment, Main Operating Base (MOB)	Low	AVN Tech
2.1.3.10.1 Ensure filler caps are			4 Inspect/Check	6.8 Evaluation/Judgement	Deployment, Main	Low	AVN Tech

secure and overflow trays are free of hydraulic fluid.			(Discrete Inspection)	(Consider Several Aspects)	Operating Base (MOB)		
2.1.3.10.2 Visually inspect the booster, utility, and auxiliary hydraulic power systems for leaks.	5 min	open up utility panels (butterfly or screwdriver latches)	4 Inspect/Check (Discrete Inspection)	6.8 Evaluation/Judgement (Consider Several Aspects)	Deployment, Main Operating Base (MOB)	Very Low	AVN Tech
2.1.3.11 Visually inspect the equipment installation cargo compartment air-conditioning turbine for correct oil levels. Record level.	30 sec	sight windows on fuselage (inside) but look at them from outside aircraft	5.9 Read (Symbol)	4.6 Evaluation/Judgement (Single Aspect)	Deployment, Main Operating Base (MOB)	Very Low	AVN Tech
2.1.3.12 Check the SPR manifold surge suppressor for correct air pressure. Replenish if required.	30 sec - 10 min for replenishing)	pry open spring activated door. To replenish, open air deflector doors (external to aircraft) - just ahead of side doors	5.9 Read (Symbol)	4.6 Evaluation/Judgement (Single Aspect)	Deployment, Main Operating Base (MOB)	Low	AVN Tech
2.1.3.13 Visually inspect the fuselage tank (if installed). Ensure the ADS locks are properly engaged.		inside the aircraft, filled with fuel etc. Do not do this at wing	4 Inspect/Check (Discrete Inspection)	6.8 Evaluation/Judgement (Consider Several Aspects)	Air-to-Air Refuelling	Very Low	AVN Tech
2.1.3.14 Visually inspect the fuselage tank fuel lines and fittings for condition and security.		do not conduct this at wing	4 Inspect/Check (Discrete Inspection)	6.8 Evaluation/Judgement (Consider Several Aspects)	Air-to-Air Refuelling	Low	AVN Tech
2.1.3.15 Visually	2 min	visual	4	6.8	Deployment,	Low	AVN Tech

inspect the cargo door and ramp hydraulic actuator mounts and hydraulic lines.		inspection	Inspect/Check (Discrete Inspection)	Evaluation/Judgement (Consider Several Aspects)	Main Operating Base (MOB)		
2.1.4 Landing Gear							
2.1.4.1 Visually inspect the LH and RH main wheel well areas and landing gears, including shock struts, torque struts, doors, tires, wheel assemblies, brake units and wear indicators. Compare to indicator limits.	10 min	open door, unlock, lock, go inside and inspect (2 people if you don't have a pogo stick). In hot environments, planes would land around 4:30 - 5:00, do inside first, and let brakes and all external stuff for later while skin cools. Time included for nose wheel.	5.9 Read (Symbol)	6.8 Evaluation/Judgement (Consider Several Aspects)	Deployment, Main Operating Base (MOB)	Low	AVN Tech
2.1.4.1.1 Visually inspect the nose wheel well area and landing gear, including shock struts, doors, tires and wheel assemblies.	5 min per gear	only done if necessary. can of oil on screw	4 Inspect/Check (Discrete Inspection)	6.8 Evaluation/Judgement (Consider Several Aspects)	Deployment, Main Operating Base (MOB)	Low	AVN Tech
2.1.4.2 Clean visually inspect and lubricate the LH and RH main landing gear ball screw	5 min per gear	Only done if necessary. can of oil on screw	4 Inspect/Check (Discrete Inspection)	6.8 Evaluation/Judgement (Consider Several Aspects)	Deployment, Main Operating Base (MOB)	Low	AVN Tech

assembly in accordance with reference.						
2.1.5 Wing						
2.1.5.1 Visually inspect the no 1 - 4, and centre dry bays for leaks. observe safety precautions outlined in C-12-130-0k0/MF-001	5 min for all 5 (1 each)	Top of wings, 1 through 4 directly behind each engine. Leave till later until a/c skin cools down. Use back emergency escape hatch to access top of aircraft	4 Inspect/Check (Discrete Inspection)	6.8 Evaluation/Judgement (Consider Several Aspects)	Air-to-Air Refuelling	AVN Tech
2.1.5.1.1 If Drogue beta light found damage, contact Radiation Safety Officer (RADSO).		air-air refuelling	3.7 Discriminate (Visual Difference)	3.7 Sign/Signal Recognition	Air-to-Air Refuelling	AVN Tech
2.1.5.2 Open the fuel bay doors for access to lines and components. (applicable to certain aircraft only) (NA for non-refuelling missions)		air-to-air			Air-to-Air Refuelling	AVN Tech
2.1.5.2.1 Partially trail the hoses for access to the interior compartment.			5 Locate/Align (Selective Orientation)	6.8 Evaluation/Judgement (Consider Several Aspects)	Air-to-Air Refuelling	AVN Tech
2.1.5.2.2 Visually inspect the LH and RH pods, pylons and attaching			4 Inspect/Check (Discrete Inspection)	6.8 Evaluation/Judgement (Consider Several Aspects)	Air-to-Air Refuelling	AVN Tech

hardware, and the MA-3 coupling and drogue assembly.							
2.2 Aero Engine							
2.2.1 Flight Deck							
2.2.1.1 Install the engine controls and dust excluder.	10 sec	tarp cover	3.7 Discriminate (Visual Difference)	1 Automatic (Simple Association)	Deployment, Main Operating Base (MOB)	Low	AVN Tech
2.2.1.2 Check the oil tank quantity (gauge readings). Replenish as required.	10 sec (5 min per engine)	looking at 4 gauges, with a/c power on. need ladder to replenish, leave of r/ac to cool down	5.9 Read (Symbol)	4.6 Evaluation/Judgement (Single Aspect)	Deployment, Main Operating Base (MOB)	Low	AVN Tech
2.2.2 Power Plants (1 through 4)	4 - 5 min total time per engine						
2.2.2.1 Visually inspect the engine cowlings, doors and panels.			4 Inspect/Check (Discrete Inspection)	6.8 Evaluation/Judgement (Consider Several Aspects)	Deployment, Main Operating Base (MOB)	Low	AVN Tech
2.2.2.2 Visually inspect the engine intake areas and install shields.		shield is a plastic plug (for intake), fabric/canvas (fitted) for exhaust. move 3 times on ladder for an engine check (front, middle, back) and ensure skin is cool	4 Inspect/Check (Discrete Inspection)	6.8 Evaluation/Judgement (Consider Several Aspects)	Deployment, Main Operating Base (MOB)	Low	AVN Tech
2.2.2.3 Visually			4	6.8	Deployment,	Low	AVN Tech

inspect the engine exhaust areas and install shields.		Inspect/Check (Discrete Inspection)	Evaluation/Judgement (Consider Several Aspects)	Main Operating Base (MOB)		
2.2.2.4 Carry out contamination check of the reduction gearbox magnetic drain plugs (2 per engine)		4 Inspect/Check (Discrete Inspection)	3.7 Sign/Signal Recognition	Deployment, Main Operating Base (MOB)	Low	AVN Tech
2.2.2.4.1 If positive, carry out contamination check in accordance with regulations.		5.9 Read (Symbol)	4.6 Evaluation/Judgement (Single Aspect)	Deployment, Main Operating Base (MOB)	Low	AVN Tech
2.2.2.5 Propellers (1 through 4)	as part of overall engine check					AVN Tech
2.2.2.5.1 Ensure blades are in proper position according to regulations.		4 Inspect/Check (Discrete Inspection)	4.6 Evaluation/Judgement (Single Aspect)	Deployment, Main Operating Base (MOB)	Low	AVN Tech
2.2.2.5.2 Visually Inspect the propellers and spinner assemblies.		4 Inspect/Check (Discrete Inspection)	6.8 Evaluation/Judgement (Consider Several Aspects)	Deployment, Main Operating Base (MOB)	Low	AVN Tech
2.2.3 Gas Turbine Compressor/Auxiliary Power Unit	part of outside fuselage inspection. Air engine component, but airframe tech generally conducts inspection.					
2.2.3.1 Visually inspect the access door, intake and exhaust area.		4 Inspect/Check (Discrete Inspection)	6.8 Evaluation/Judgement (Consider Several Aspects)	Deployment, Main Operating Base (MOB)	Low	AVN Tech

2.2.3.2 Check the oil quantity. Replenish as required and record.	10 sec (replenish 5 min)	performed inside aircraft	5.9 Read (Symbol)	4.6 Evaluation/Judgement (Single Aspect)	Deployment, Main Operating Base (MOB)	Low	AVN Tech
2.3 Instrumental Electrical							
2.3.1 General							
2.3.1.1 Carry out an operational check of the interior and exterior lighting systems and replenish bulb box.	5 min (2 concurrently)	replenishment can take a while - need supply etc..	4 Inspect/Check (Discrete Inspection)	3.7 Sign/Signal Recognition	Deployment, Main Operating Base (MOB)	Low	AVN Tech
2.3.1.2 Ensure the emergency exit light ejector handles are witness wired in accordance with regulations.	1 min 2 min to rewire each	7 in aircraft.	3.7 Discriminate (Visual Difference)	4.6 Evaluation/Judgement (Single Aspect)	Deployment, Main Operating Base (MOB)	Very Low	AVN Tech
2.3.1.3 Carry out a BITE check on aircraft returning from an air-to-air refuelling (AAR) mission.		air-to-air	4 Inspect/Check (Discrete Inspection)	4.6 Evaluation/Judgement (Single Aspect)	Air-to-Air Refuelling	Low	AVN Tech
2.3.2 Flight Deck		part of bulb box					
2.3.2.1 Ensure there are 4 tagged circuit-breaker clips accounted for.			4 Inspect/Check (Discrete Inspection)	3.7 Sign/Signal Recognition	Deployment, Main Operating Base (MOB)	Very Low	AVN Tech
2.3.3 Fuselage							
2.3.3.1 Visually inspect the pitot heads and static vents for cleanliness. Install	1 -2 min		4 Inspect/Check (Discrete Inspection)	6.8 Evaluation/Judgement (Consider Several Aspects)	Deployment, Main Operating Base (MOB)	Low	AVN Tech

Covers.							
2.3.3.2 Visually inspect the battery sump jar and bases. Pay particular attention for evidence of electrolyte leakage.	30 sec	jar is no longer used as new battery exists	4 Inspect/Check (Discrete Inspection)	6.8 Evaluation/Judgement (Consider Several Aspects)	Deployment, Main Operating Base (MOB)	Low	AVN Tech
2.3.3.3 Visually inspect the air-to-air refuelling system fuselage tank wiring, components and attaching hardware for condition and security.		air to air	4 Inspect/Check (Discrete Inspection)	6.8 Evaluation/Judgement (Consider Several Aspects)	Deployment, Main Operating Base (MOB)	Low	AVN Tech
2.3.4 Wing							
2.3.4.1 Carry out an operational check of the wing isolation valves in accordance with regulations. (applicable for subset of aircraft)	1 min	airframe specific (e model) 2 valves (1 min total)	5.9 Read (Symbol)	6.8 Evaluation/Judgement (Consider Several Aspects)	Deployment, Main Operating Base (MOB)	Low	AVN Tech
2.3.4.2 Carry out and operational check of the wing divider valves in accordance with regulations (applicable for subset of aircraft)	30 sec	h model only	5.9 Read (Symbol)	6.8 Evaluation/Judgement (Consider Several Aspects)	Deployment, Main Operating Base (MOB)	Low	AVN Tech
2.3.4.3 Visually inspect the pod signal lamps for condition and		air-to-air	4 Inspect/Check (Discrete Inspection)	6.8 Evaluation/Judgement (Consider Several Aspects)	Air-to-Air Refuelling	Very Low	AVN Tech

security.							
2.4 Safety Systems							
2.4.1 General							
2.4.1.1 Check the liquid oxygen system quantity. Replenish as required.	30 sec to check, replenish up to an hour		5.9 Read (Symbol)	4.6 Evaluation/Judgement (Single Aspect)	Deployment, Main Operating Base (MOB)	Low	AVN Tech
2.4.1.2 Visually inspect the 25-litre liquid oxygen converter cover and visible lines/fittings.	30 sec	located in nose gear compartment	4 Inspect/Check (Discrete Inspection)	6.8 Evaluation/Judgement (Consider Several Aspects)	Deployment, Main Operating Base (MOB)	Very Low	AVN Tech
2.4.1.3 Ensure the oxygen regulator is left in the normal position and the diluter in the 100 percent position.	4 min total	inside aircraft - at least 9	4 Inspect/Check (Discrete Inspection)	3.7 Sign/Signal Recognition	Deployment, Main Operating Base (MOB)	Low	AVN Tech
2.4.1.3.1 Visually inspect the A13A and quick-donning Sierra oxygen masks. Clean as required.			4 Inspect/Check (Discrete Inspection)	4.6 Evaluation/Judgement (Single Aspect)	Deployment, Main Operating Base (MOB)	Low	AVN Tech
2.4.1.4 Visually inspect all storage racks, survival and emergency equipment. Ensure all kits are stowed and that the .020-inch copper shear wire on the emergency equipment rack cables are intact at	1 min		4 Inspect/Check (Discrete Inspection)	4.6 Evaluation/Judgement (Single Aspect)	Deployment, Main Operating Base (MOB)	Low	AVN Tech

both ends of the cable.							
2.5 Comm Radar Systems AVS 526							
2.5.1 Visually inspect the CRS components, controls and wiring	7 - 8 min		4 Inspect/Check (Discrete Inspection)	6.8 Evaluation/Judgement (Consider Several Aspects)	Deployment, Main Operating Base (MOB)	Low	AVS Tech
2.5.2 Ensure all equipment is turned off and equipment is set to a lowered position, deselected etc.	30 sec	there is no card associated with reconfiguring equipment for shutdown	4 Inspect/Check (Discrete Inspection)	6.8 Evaluation/Judgement (Consider Several Aspects)	Deployment, Main Operating Base (MOB)	Low	AVS Tech
2.5.3 Visually inspect all external antennas	2 min		4 Inspect/Check (Discrete Inspection)	6.8 Evaluation/Judgement (Consider Several Aspects)	Deployment, Main Operating Base (MOB)	Low	AVS Tech
2.5.4 Ensure all headsets and inter-communication system, cords, are accounted for and properly stored	3 -4 min		4 Inspect/Check (Discrete Inspection)	4.6 Evaluation/Judgement (Single Aspect)	Deployment, Main Operating Base (MOB)	Low	AVS Tech
2.6 Integral Systems AVS 526	5 sec						
2.6.1 Ensure the true airspeed (TAS) probe heater switch is selected off			4 Inspect/Check (Discrete Inspection)	3.7 Sign/Signal Recognition	Deployment, Main Operating Base (MOB)	Very Low	AVS Tech
3 AB Check							
3.1 Airframe							
3.1.1 General							
3.1.1.1 Visually inspect all aircraft	7 - 8 min	outside walk-around	4 Inspect/Check	6.8 Evaluation/Judgement	Deployment, Main	Low	AVN Tech

exterior surfaces.			(Discrete Inspection)	(Consider Several Aspects)	Operating Base (MOB)		
3.1.2 Flight Deck							
3.1.2.1 Clean and visually inspect all flight deck windows.	15 - 20 min		4 Inspect/Check (Discrete Inspection)	6.8 Evaluation/Judgement (Consider Several Aspects)	Deployment, Main Operating Base (MOB)	Low	AVN Tech
3.1.3 Fuselage							
3.1.3.1 Visually inspect the booster, utility and auxiliary hydraulic reservoirs for proper fluid levels. Replenish as required.	5 - 6 min		5.9 Read (Symbol)	4.6 Evaluation/Judgement (Single Aspect)	Deployment, Main Operating Base (MOB)	Low	AVN Tech
3.1.3.1.1 Ensure filler caps are secure and overflow trays are free of fluid.			4 Inspect/Check (Discrete Inspection)	4.6 Evaluation/Judgement (Single Aspect)	Deployment, Main Operating Base (MOB)	Low	AVN Tech
3.1.4 Landing Gear	10 min total time	do not take tire pressure for this check					
3.1.4.1 Visually inspect the LH and RH main wheel well are and landing gears, including the brake assemblies.			4 Inspect/Check (Discrete Inspection)	6.8 Evaluation/Judgement (Consider Several Aspects)	Deployment, Main Operating Base (MOB)	Low	AVN Tech
3.1.4.2 Visually inspect the nose wheel well are and landing gear.			4 Inspect/Check (Discrete Inspection)	6.8 Evaluation/Judgement (Consider Several Aspects)	Deployment, Main Operating Base (MOB)	Low	AVN Tech
3.1.5 Wing							
3.1.5.1 if Drogue		air-to-air	3.7	3.7 Sign/Signal	Air-to-Air		AVN Tech

beta light found damage, contact Radiation Safety Officer (RADSO).			Discriminate (Visual Difference)	Recognition	Refuelling		
3.1.5.2 Visually inspect the MA-3 coupling and assembly, LH and RH pods, pylons and attaching hardware in accordance with regulations (applicable for subset of aircraft).		air-to-air	4 Inspect/Check (Discrete Inspection)	6.8 Evaluation/Judgement (Consider Several Aspects)	Air-to-Air Refueling	Low	AVN Tech
3.2 Aero Engine							
3.2.1 Flight Deck	same as before						AVN Tech
3.2.1.1 Check the oil tank quantity (gauge readings), replenish as required and record.			5.9 Read (Symbol)	4.6 Evaluation/Judgement (Single Aspect)	Deployment, Main Operating Base (MOB)	Low	AVN Tech
3.2.1.2 Check the fuel state (gauge readings) and record.	5 min now	in case of ops restriction, person who signs fuel needs to physically check state of tanks (dip stick),	5.9 Read (Symbol)	4.6 Evaluation/Judgement (Single Aspect)	Deployment, Main Operating Base (MOB)	Low	AVN Tech
3.2.1.2.1 Verify fuel quantity gauges with press-to-test switch.	2 min for 8		4 Inspect/Check (Discrete Inspection)	3.7 Sign/Signal Recognition	Deployment, Main Operating Base (MOB)	Low	AVN Tech
3.2.2 Power Plants (1 through 4)	5 min per engine total time						

3.2.2.1 Visually inspect the engine cowlings, doors and panels.		4 Inspect/Check (Discrete Inspection)	6.8 Evaluation/Judgement (Consider Several Aspects)	Deployment, Main Operating Base (MOB)	Low	AVN Tech
3.2.2.2 Visually inspect the engine intake and air scoop areas.		4 Inspect/Check (Discrete Inspection)	6.8 Evaluation/Judgement (Consider Several Aspects)	Deployment, Main Operating Base (MOB)	Low	AVN Tech
3.2.2.3 Visually inspect the engine exhausts and tailpipe areas.		4 Inspect/Check (Discrete Inspection)	6.8 Evaluation/Judgement (Consider Several Aspects)	Deployment, Main Operating Base (MOB)	Low	AVN Tech
3.2.2.4 Visually inspect the lower pulley yoke assemblies for condition and security.		4 Inspect/Check (Discrete Inspection)	6.8 Evaluation/Judgement (Consider Several Aspects)	Deployment, Main Operating Base (MOB)	Low	AVN Tech
3.2.2.5 Propellers (1 through 4)						AVN Tech
3.2.2.5.1 Visually inspect the propellers and spinner assemblies.		4 Inspect/Check (Discrete Inspection)	6.8 Evaluation/Judgement (Consider Several Aspects)	Deployment, Main Operating Base (MOB)	Low	AVN Tech
3.3 Safety Systems						
3.3.1 General	see previously					
3.3.1.1 Check the aircraft liquid oxygen quantity. Replenish as required.	5 sec, replenish 1.5 hr	5.9 Read (Symbol)	4.6 Evaluation/Judgement (Single Aspect)	Deployment, Main Operating Base (MOB)	Low	AVN Tech
3.3.1.2 Ensure the oxygen regulator is left in the normal position and the	20 sec	5 Locate/Align (Selective Orientation)	3.7 Sign/Signal Recognition	Deployment, Main Operating Base (MOB)	Very Low	AVN Tech

diluter is in the 100 percent position.						
3.3.1.3 Visually inspect the A13A and quick-donning Sierra oxygen masks. Clean as required.	1 min	4 Inspect/Check (Discrete Inspection)	6.8 Evaluation/Judgement (Consider Several Aspects)	Deployment, Main Operating Base (MOB)	Low	AVN Tech
3.3.1.4 Visually inspect the portable oxygen assemblies. Replenish as required.	5 sec	4 Inspect/Check (Discrete Inspection)	4.6 Evaluation/Judgement (Single Aspect)	Deployment, Main Operating Base (MOB)	Low	AVN Tech
3.3.1.5 Visually inspect the fire protection equipment.	15 sec	4 Inspect/Check (Discrete Inspection)	6.8 Evaluation/Judgement (Consider Several Aspects)	Deployment, Main Operating Base (MOB)	Very Low	AVN Tech
3.3.1.6 Visually inspect the Halon 1211 portable fire extinguishers in accordance with regulations. IF recharge is required, replace with a serviceable item. Ensure that the witness wires and lead seals are installed on the fire extinguisher and mounting bracket. ZZS	5 sec	4 Inspect/Check (Discrete Inspection)	6.8 Evaluation/Judgement (Consider Several Aspects)	Deployment, Main Operating Base (MOB)	Low	AVN Tech
4 DI - Daily Inspection	Not Assessed					
5 PI - Primary Inspection	Not Assessed					

5.1 Airframe	Not Assessed	
5.1.1 Fuselage	Not Assessed	
5.1.1.1 Clean and Inspect Cargo handling System	Not Assessed	AVN Tech
5.1.1.1.1 Remove outboard rail assembly and crossover control cover guards	Not Assessed	AVN Tech
5.1.1.1.2 Wash the complete system	Not Assessed	AVN Tech
5.1.1.1.3 Thoroughly rinse with fresh water	Not Assessed	AVN Tech
5.1.1.1.4 Visually inspect the complete system, paying particular attention to the controls, locks and rails.	Not Assessed	AVN Tech
5.1.1.1.5 Carry out a system functional check	Not Assessed	AVN Tech
5.1.1.1.6 Reinstall the rail assembly and removed guards	Not Assessed	AVN Tech
5.1.1.2 Visually inspect the fuselage tank (when installed).	Not Assessed	AVN Tech
5.1.1.2.1 Ensure the ADS locks are	Not Assessed	AVN Tech

properly engaged.		
5.1.1.3 Visually inspect the fuselage tank fuel lines and fittings for condition and security.	Not Assessed	AVN Tech
5.1.1.4 Clean and Inspect the aft fuselage.	Not Assessed	AVN Tech
5.1.1.5 Visually inspect the cooling turbine for proper oil leve. Record level.	Not Assessed	AVN Tech
5.1.2 Landing Gear	Not Assessed	
5.1.2.1 Clean, Visually Inspect and lubricate the LH and RH main landing gear ball screw assembly.	Not Assessed	AVN Tech
5.1.2.2 Clean and lubricate the nose landing gear up lock assembly side plates, latch and guide.	Not Assessed	AVN Tech
5.1.2.2.1 Check the lock hanger bolt for freedom of movement and lubricate.	Not Assessed	AVN Tech
5.1.3 Wing	Not Assessed	
5.1.3.1 With flaps lowered, Visually inspect the flap leading edges and	Not Assessed	AVN Tech

well areas.		
5.1.3.2 Visually inspect the LH and RH pods, pylons and attaching hardware.	Not Assessed	AVN Tech
5.1.3.2.1 Fully trail hoses and visually inspect the interior compartment, hose assembly, MA-3 coupler and drogue assembly.	Not Assessed	AVN Tech
5.1.3.2.2 Carry out an air refuelling operation BITE check.	Not Assessed	AVN Tech
5.1.3.2.3 Record pod meter hours.	Not Assessed	AVN Tech
5.1.4 Aero Engine	Not Assessed	
5.1.4.1 Check the fuel system for contamination at the fuel tank drains and sump.	Not Assessed	AVN Tech
5.1.5 Flight Dck	Not Assessed	
5.1.5.1 Check the engine throttle, condition and propeller levels for free and full travel.	Not Assessed	AVN Tech
5.1.6 Power Plants 1 through 4	Not Assessed	
5.1.6.1 Remove cowlings, panels and doors. Visually	Not Assessed	AVN Tech

insepct		
5.1.6.2 Visually inspect the starters and check for oil level, replenish as required.	Not Assessed	AVN Tech
5.1.6.3 Carry out continuity check on the engine power section magnetic plugs.	Not Assessed	AVN Tech
5.1.6.4 Visually inspect the engine power section and reduction gearbox filters for protrusion of filter bypass.	Not Assessed	AVN Tech
5.1.6.5 Check the engine oil quantities. Replenish as required and record	Not Assessed	AVN Tech
5.1.6.6 Visually inspect the engine controls (throttle and condition) for condition, security and free and full travel.	Not Assessed	AVN Tech
5.1.6.7 Check the fire seal for proper positioning.	Not Assessed	AVN Tech
5.1.6.8 Visually inspect the in-line hydraulic filter assembly for protrusion of filter	Not Assessed	AVN Tech

bypass (red buttons).		
5.1.7 Gas Turbine Compressor/Auxiliary Power Unit	Not Assessed	
5.1.7.1 Visually inspect the exposed area. Record hours and starts.	Not Assessed	AVN Tech
5.2 Aero Engine	Not Assessed	
5.2.1 General	Not Assessed	
5.2.1.1 Check the fuel system for contamination at the fuel tank drains and sump.	Not Assessed	AVN Tech
5.2.2 Flight Deck	Not Assessed	
5.2.2.1 Check the engine throttle, condition and propeller levels for free and full travel.	Not Assessed	AVN Tech
5.2.3 Power Plants (No. 1 - 4)	Not Assessed	
5.2.3.1 Remove/open cowlings, panels and doors. Visually inspect.	Not Assessed	AVN Tech
5.2.3.2 Visually inspect the starters and check oil level; replenish as required.	Not Assessed	AVN Tech
5.2.3.3 Carry out	Not Assessed	AVN Tech

continuity check on the engine power section magnetic plugs.		
5.2.3.4 Visually inspect the engine power section and reduction gearbox filters for protrusion of filter bypass (red buttons).	Not Assessed	AVN Tech
5.2.3.5 Check the engine oil quantities; replenish as required and enter on CF335.	Not Assessed	AVN Tech
5.2.3.6 Visually inspect the engine controls (throttle and condition) for condition, security, and free and full travel.	Not Assessed	AVN Tech
5.2.3.7 Visually inspect the QECU area.	Not Assessed	AVN Tech
5.2.3.8 Visually inspect the in-line hydraulic filter assembly for protrusion of filter bypass (red buttons).	Not Assessed	AVN Tech
5.2.4 Gas Turbine Compressor/Auxiliary Power Unit	Not Assessed	
5.2.4.1 Visually	Not Assessed	AVN Tech

inspect the exposed areas. Record the hours and starts.		
5.3 Instrument Electrical	Not Assessed	
5.3.1 General	Not Assessed	
5.3.1.1 Functionally check the emergency exit light assemblies for corrosion and condition of batteries	Not Assessed	AVN Tech
5.3.1.1.1 Replace batteries if necessary.	Not Assessed	AVN Tech
5.3.2 Fuselage	Not Assessed	
5.3.2.1 Visually inspect the generator control panels and attaching hardware. Ensure the ejector handles are lockwired in the fully closed position.	Not Assessed	AVN Tech
5.3.2.2 Visually inspect the crew, paratroop and ramp door switches.	Not Assessed	AVN Tech
5.3.3 Landing Gear	Not Assessed	
5.3.3.1 Visually inspect the landing gear switches, wiring and attaching hardware for security, corrosion	Not Assessed	AVN Tech

and condition.		
5.3.3.1.1 Check the switches for water ingress and chafing or broken wires.	Not Assessed	AVN Tech
5.3.3.1.2 Lubricate switches.	Not Assessed	AVN Tech
5.4 Safety Systems	Not Assessed	
5.4.1 General	Not Assessed	
5.4.1.1 Visually inspect and functionally check the following	Not Assessed	AVN Tech
5.4.1.1.1 Troop seat belt	Not Assessed	AVN Tech
5.4.1.1.2 Aircrew, lap and shoulder harness assembly	Not Assessed	AVN Tech
5.4.1.1.3 Inertia reel (pilot and co-pilot)	Not Assessed	AVN Tech
5.4.1.1.4 Inertia reel (navigator and flight engineer)	Not Assessed	AVN Tech
5.4.1.2 Visually inspect and functionally check the following items	Not Assessed	AVN Tech
5.4.1.2.1 Oxygen regulator	Not Assessed	AVN Tech
5.4.1.2.2 Flexible tube (regulator to mask)	Not Assessed	AVN Tech
5.4.1.3 Visually	Not Assessed	AVN Tech

inspect the fixed fire extinguisher system. Ensure the correct pressure.			
5.4.1.4 Visually inspect the cargo and wing life-raft release handle assemblies. Ensure witness wires are intact.	Not Assessed		AVN Tech
5.4.1.5 Visually inspect all crew emergency flashlight assemblies.	Not Assessed		AVN Tech
5.4.1.5.1 Ensure the shear wires are intact.	Not Assessed		AVN Tech
5.4.1.5.2 Ensure that the monitor LED is on and verify the battery expiry date on the Calendar Time Inspection label. Replace the battery as required.	Not Assessed		AVN Tech
5.4.2 Wing	Not Assessed		
5.4.2.1 Visually inspect the life-raft compartment doors. Ensure the latches are engaged and the witness wire is intact.	Not Assessed		AVN Tech
5.5 Comm Radar Systems	Not Assessed		

5.5.1 General	Not Assessed	
5.5.1.1 Visually inspect the CRS components, control and system wiring.	Not Assessed	AVS Tech
5.5.1.2 Ensure all equipment is turned off.	Not Assessed	AVS Tech
5.5.1.3 Visually inspect all external antennas.	Not Assessed	AVS Tech
5.5.1.4 Visually inspect the 17 static dischargers.	Not Assessed	AVS Tech
5.5.1.5 Visually inspect and operationally check the APN 59 transceiver cooling fans in the nose landing gear. Ensure free and smooth rotation.	Not Assessed	AVS Tech
5.5.1.6 Visually inspect the HD-186/ASQ desicant.	Not Assessed	AVS Tech
5.5.2 Flight Deck	Not Assessed	
5.5.2.1 Remove the battery from the KY 58 and ANDVT secure voice systems and visually inspect.	Not Assessed	AVS Tech
5.5.2.1.1 install serviceable items	Not Assessed	AVS Tech

5.5.3 Fuselage	Not Assessed	
5.5.3.1 Visually inspect the ELT 406 transmitter and interface unit.	Not Assessed	AVS Tech
5.6 Integral Systems	Not Assessed	
5.6.1 Flight Deck	Not Assessed	
5.6.1.1 Ensure the standby compass correction card is legible and up to date.	Not Assessed	AVS Tech
5.6.1.2 Visually inspect the equipment rack wiring.	Not Assessed	AVS Tech
5.6.1.3 Carry out system functional chek of the AN/ASH-502(V) flight recording system in accordance with regulations.	Not Assessed	AVS Tech
5.6.1.4 Carry out a system functional check on the CVR A100A cockpit voice recorder in accordance with regulations.	Not Assessed	AVS Tech
5.6.2 Fuselage	Not Assessed	
5.6.2.1 Functionally check the total temperature heater probe.	Not Assessed	AVS Tech

6 Conditional Inspections (for suspected problems, or when you exceed aircraft limitations)							
6.1 Operation in Sand, Dust or High Ambient Temperatures (CON 19)							All Trades
6.1.1 Engine and Engine Components	take a hole night to perform the engine checks	problems with engine bleed valves, informed by FE					AVN Tech
6.1.1.1 Remove and Clean and Reinstall the engine 14th stage bleed valve	1 hour per engine	brings stand, open engine connings, not overly strenuous	3.7 Discriminate (Visual Difference)	4.6 Evaluation/Judgement (Single Aspect)	Deployment, Main Operating Base (MOB)	Moderate	AVN Tech
6.1.1.2 Remove, clean and reinstall the 5th and 10th stage engine compressor bleed valves.		see above			Deployment, Main Operating Base (MOB)	Moderate	AVN Tech
6.1.1.3 Remove, clean and reinstall the engine starter control valve filters.					Deployment, Main Operating Base (MOB)	Moderate	AVN Tech
6.1.1.4 Check for proper operation of the engin anti-icing solenoid valves					Deployment, Main Operating Base (MOB)	Moderate	AVN Tech
6.1.1.5 Clean the engine compressor inlet pressure probe					Deployment, Main Operating	Moderate	AVN Tech

sensing line to the fuel control in accordance with the applicable maintenance manuals		Base (MOB)		
6.1.1.6 Check the engine oil and service to maximum recommended oil quantity		Deployment, Main Operating Base (MOB)	Low	AVN Tech
6.1.1.7 Check for proper operation of the engine starter valves		Deployment, Main Operating Base (MOB)	Low	AVN Tech
6.1.1.8 Check the temperature datum amplifier sart limit for proper adjustment		Deployment, Main Operating Base (MOB)	Low	AVN Tech
6.1.1.9 Adjust the temperature datum (TD) valve null orifice for a minimum of 780 degrees celcius turbine inlet temperature (TIT) during engine starts.		Deployment, Main Operating Base (MOB)	Low	AVN Tech
6.1.1.10 Check the engine coordinator-to-propeller linkage for proper adjustment		Deployment, Main Operating Base (MOB)	Low	AVN Tech
6.1.2 Propeller and Propeller components	1 hour per prop minimum.			AVN Tech

	need crane, heavy physical task. lots of room for error,				
6.1.2.1 Remove, clean and reinstall the propeller control vent filter			Deployment, Main Operating Base (MOB)	Moderate	AVN Tech
6.1.2.2 Drain and service the propeller ground start/ground idle blade angles.			Deployment, Main Operating Base (MOB)	Low	AVN Tech
6.1.2.3 Check the NTS bracket for clearance adjustments and adequate lubrication			Deployment, Main Operating Base (MOB)	Low	AVN Tech
6.1.3 Auxiliary power Unit					AVN Tech
6.1.3.1 Drain and service the GTC/ATM (as applicable) or APU	1 hour (only one)		Deployment, Main Operating Base (MOB)	Low	AVN Tech
6.1.3.1.1 replace if unit does not meet performance requirements	6 hours	special equipment, heavy manual labour (similar to prop).	Deployment, Main Operating Base (MOB)	Moderate	AVN Tech
6.1.4 Miscellaneous Aircraft Systems					AVN Tech
6.1.4.1 Inspect the flight deck and cargo compartment air-conditioning	4 - 6 hours	internal to aircraft - flight deck, cargo - outside	Deployment, Main Operating Base (MOB)	Low	AVN Tech

system water separator condensers for cleanliness					
6.1.4.2 Inspect the outflow valve filter for cleanliness	3 hours	remove armour plating, very awkward, use air con to keep area cool	Deployment, Main Operating Base (MOB)	Moderate	AVN Tech
6.1.4.3 Clean or replace the flight deck and cargo compartment flow control valve filters	1.5hr per valve filter (2)	awkward, but not heavy labour	Deployment, Main Operating Base (MOB)	Low	AVN Tech
6.1.4.4 Clean or replace the cabin pressure controller filters	10 min	easy, minimal task with no power to aircraft,	Deployment, Main Operating Base (MOB)	Low	AVN Tech
6.1.4.5 Inspect lubrication points in the NLG/MLG wheel wells, flap wells, and flight control components for premature wear caused by excessive accumulation of grease. Clean and lubricate in accordance with the applicable inspection work card.		this is conducted on the PI. Not typically done due to length of time required to conduct service.	Deployment, Main Operating Base (MOB)	Low	AVN Tech
6.2 Severe Braking During Turns (CON 25)					
6.3 Lightning Strike (CON 2)					

6.4 Hard Landing (CON 5)				
6.5 Unusual Flight Attitude/Manoeuvres (CON 6)				
6.6 Engine Overtorque (CON 20)				
6.6.1 Condition 1		within 100 flying hours, after an engine develops an indicated torque between 19 600 and 22 000 inch-pounds during take-off from a smooth runway, or during flight in light to moderate gusts, or during normal manoeuvres		AVN Tech
6.6.1.1 Visually inspect the QECU and aft nacelle cowling, skins and doors for wrinkles, buckling and loose missing or pulled fasteners	1 hour per engine	ladder, opening panels, looking for cracks, buckles, sealants cracked etc.	Low	AVN Tech
6.6.2 Condition 2	overall takes 1hr - 1.5hr	Upon return to unit (RTU) but no later than 25 flying hours, after an engine develops an indicated torque		AVN Tech

		between 19 600 and 22 000 inch/pounds during take-off from a rough runway, or during flight in moderate to severe gusts, or during maximum manoeuvres					
6.6.2.1 Carry Out Condition 1 Inspection							AVN Tech
6.6.2.2 Using a flashlight and mirror, visually inspect the following areas							AVN Tech
6.6.2.2.1 Without removing the fire shields, visually inspect the QECU upper and lower longerson, for cracks and the fasteners attaching the fire wall to the upper longerons for loose or missing fasteners	1 hour to leve 1 check	visual inspection for the most part				Low	AVN Tech
6.6.2.2.1.1 Visually inspect the QECU centre mount beam for cracks		figure 6-1-5 in NR	4 Inspect/Check (Discrete Inspection)	4.6 Evaluation/Judgement (Single Aspect)	Deployment, Main Operating Base (MOB)	Low	AVN Tech
6.6.2.2.1.2 Inspect the QECU diagonal brace for cracks		figure 6-1-5	4 Inspect/Check (Discrete	4.6 Evaluation/Judgement (Single Aspect)	Deployment, Main Operating	Low	AVN Tech

			Inspection)		Base (MOB)		
6.6.2.2.1.3 Inspect the disconnect fittings in the aft end of the QECU for cracks, alignment and security			4 Inspect/Check (Discrete Inspection)	6.8 Evaluation/Judgement (Consider Several Aspects)	Deployment, Main Operating Base (MOB)	Low	AVN Tech
6.6.2.2.2 Inspect the aft truss longeron diagonal lugs and diagonal brace, bolts and attachment to the front beam for cracks and loose and missing fasteners	30 min per engine	figure 2-1-5, ladder, visual inspection	4 Inspect/Check (Discrete Inspection)	6.8 Evaluation/Judgement (Consider Several Aspects)	Deployment, Main Operating Base (MOB)	Low	AVN Tech
6.6.2.2.3 Inspect the aft truss upper tangs (truss wing/rib fitting) (inside dry bray) and bolts for cracks		figure 6-1-5	4 Inspect/Check (Discrete Inspection)	4.6 Evaluation/Judgement (Single Aspect)	Deployment, Main Operating Base (MOB)	Low	AVN Tech
6.6.2.2.4 Inspect the centre wing and outer wing upper engine truss fittings to the rib/former attachment fitting and former for cracks	30 MIN	visual inspection per engine (open panels behind engine)	4 Inspect/Check (Discrete Inspection)	4.6 Evaluation/Judgement (Single Aspect)	Deployment, Main Operating Base (MOB)	Low	AVN Tech
6.6.2.2.5 Inspect the drag angle (aft truss wing lower surface) and nacelle for cracks and loose	15 min	visual inspection, exposed part, on ladder	4 Inspect/Check (Discrete Inspection)	6.8 Evaluation/Judgement (Consider Several Aspects)	Deployment, Main Operating Base (MOB)	Low	AVN Tech

or missing fasteners							
6.6.2.2.6 Inspect the entire rib assembly and installation inside the dry bays at CWS 178 and former installations at CWS 213, OWS 163 and OWS 197		climb on top of wing, behind each engine (quick disconnects and electrical connections for engine). wait for night after sun down	4 Inspect/Check (Discrete Inspection)	6.8 Evaluation/Judgement (Consider Several Aspects)		Low	AVN Tech
6.6.2.2.7 Inspect the wing forward beam web and fasteners between CWS 178 and CWS 220 and between OWS 162 and OWS 197		between dry bay and engine, on top and on ladder	4 Inspect/Check (Discrete Inspection)	6.8 Evaluation/Judgement (Consider Several Aspects)	Deployment, Main Operating Base (MOB)	Low	AVN Tech
6.6.2.2.8 Inspect the upper and lower wing panels between CWS 160 and CWS 220, and between OWS 144 and OWS 214		visual inspect, buckling in the panels	4 Inspect/Check (Discrete Inspection)	4.6 Evaluation/Judgement (Single Aspect)	Deployment, Main Operating Base (MOB)	Low	AVN Tech
6.6.2.2.9 Inspect the engine power section and reduction gearbox magnetic oil drain plugs for contamination	10- 15 min	reduction gearbox checked on A check, power section normally done on a PI	4 Inspect/Check (Discrete Inspection)	4.6 Evaluation/Judgement (Single Aspect)	Deployment, Main Operating Base (MOB)	Low	AVN Tech
6.6.2.2.10 Inspect the engine power section and reduction gearbox	1.5hr	removing oil filter and checking for metal particles.	4 Inspect/Check (Discrete Inspection)	4.6 Evaluation/Judgement (Single Aspect)	Deployment, Main Operating Base (MOB)	Low	AVN Tech

oil filters for contamination		take out and replace filter					
6.6.2.3 Carry out a non-destructive testing on the aft truss tangs, the holes closest to the web for cracks		if required, may need to call someone outside to do it. May get a minor when plane return s to wing	4 Inspect/Check (Discrete Inspection)	4.6 Evaluation/Judgement (Single Aspect)	Deployment, Main Operating Base (MOB)	Low	AVN Tech
6.6.2.4 Check the following bolts for torque	2-3 hrs per engine	they use a crane, remove weight off engine, use a sling and then check torque				Moderate	AVN Tech
6.6.2.4.1 upper QECU aft attaching bolts			4 Inspect/Check (Discrete Inspection)	4.6 Evaluation/Judgement (Single Aspect)	Deployment, Main Operating Base (MOB)	Moderate	AVN Tech
6.6.2.4.2 lower QECU aft attaching bolts			4 Inspect/Check (Discrete Inspection)	4.6 Evaluation/Judgement (Single Aspect)	Deployment, Main Operating Base (MOB)	Moderate	AVN Tech
6.6.2.5 If any of the following conditions exist, remove and replace the front engine mounts (lord mounts), then tag and process	8 - 10 hours	could be done on deployment, time consuming, not demanding	4 Inspect/Check (Discrete Inspection)	6.8 Evaluation/Judgement (Consider Several Aspects)	Deployment, Main Operating Base (MOB)	Low	AVN Tech
6.6.2.5.1 If the minimum torque on the front engine mount attaching bolts is less thatn 400 inch-pounds							AVN Tech
6.6.2.5.2 If the							AVN Tech

rubber of the front engine mount has flex cracks that have progressed inwardly							
6.6.2.5.3 evidence of delamination							AVN Tech
6.6.2.6 Inspect the rear engine mount (installed) for condition and security	30 min	performed while panels are open as part of other checks	4 Inspect/Check (Discrete Inspection)	6.8 Evaluation/Judgement (Consider Several Aspects)	Deployment, Main Operating Base (MOB)	Low	AVN Tech
6.6.3 Condition 3		remove engines, go into fuel tanks; likely sent to third line contractor for this type of maintenance. Manpower issues, temperature				Heavy	AVN Tech
6.6.3.1 Upon return to unit (RTU) but no later than 25 flying hours, after an engine develops an indicated torque between 22 000 and 24 000 inch-pounds							AVN Tech
6.6.3.1.1 Carry out Condition 1 Check							AVN Tech
6.6.3.1.2 Carry out condition 2 check							AVN Tech
6.6.3.1.3 Remove and Replace the front engine lord		If removal of engine mounts is not feasible,					AVN Tech

mounts		attach a quarantine tag to each mount with the following statement: THIS MOUNT HAS BEEN SUBJECTED TO OVERTORQUE		
6.6.4 Condition 4		If an engine indicated torque exceeds 24 000 inch pounds, immediately carry out Conditions 1, 2 and 3 inspections	Heavy	AVN Tech
6.6.4.1 Carry out Condition 1 check				AVN Tech
6.6.4.2 Carry out Condition 2 check				AVN Tech
6.6.4.3 Carry out Condition 3 check				AVN Tech
6.6.4.4 If evidence of failure is found, dispose of part				AVN Tech
6.7 Heavy Landing or Operation From Unprepared Runways (CON 22)				
6.8 Landing with Fuel Unbalance or Excessive Fuel (CON 23)				

6.9 Landing Lights Overspeed (CON 24)							
6.10 Cargo and Door and Ramp Overspeed (CON 26)							
6.10.1 Carry out visual inspection of the cargo door, ramp actuators and actuator attachment points	altogether 4 - 5 hours	Rudder torque arm requires removing panels and sticking head up in platypus (confined space - requires 6 people, significant level of effort)				Moderate	AVN Tech
6.10.1.1 Visually inspect the entire cargo door for wrinkles, cracks, distortion and loose or missing fasteners	30min	could be done during the day	4 Inspect/Check (Discrete Inspection)	6.8 Evaluation/Judgement (Consider Several Aspects)	Deployment, Main Operating Base (MOB)	Low	AVN Tech
6.10.1.2 Visually inspect the ramp and cargo door hydraulic actuators and upper and lower attaching points for security, cracks and distortion			4 Inspect/Check (Discrete Inspection)	6.8 Evaluation/Judgement (Consider Several Aspects)	Deployment, Main Operating Base (MOB)	Low	AVN Tech
6.10.1.3 Visually inspect the rudder torque arms for cracks and distortion	10 min		4 Inspect/Check (Discrete Inspection)	6.8 Evaluation/Judgement (Consider Several Aspects)	Deployment, Main Operating Base (MOB)	Moderate	AVN Tech
6.10.1.4 Visually			4	6.8	Deployment,	Low	AVN Tech

inspect the vertical and horizontal stabilizers for cracks, distortion and loose or missing fasteners		Inspect/Check (Discrete Inspection)	Evaluation/Judgement (Consider Several Aspects)	Main Operating Base (MOB)		
6.10.1.5 Visually inspect the elevator hinge points for binding, cracks, distortion and security		4 Inspect/Check (Discrete Inspection)	6.8 Evaluation/Judgement (Consider Several Aspects)	Deployment, Main Operating Base (MOB)	Low	AVN Tech
6.11 Paratroop Door and Paratroop Door Air Deflector Overspeed (COND 27)						
6.12 Fuel Distribution Overspeed (CON 28)						
6.13 Weight Limits in Flight Exceeded (CON 29)						
6.14 Hot Brakes (CON 30)						
6.15 Ground Strike due to Over-Rotation (CON 31)						
6.16 Flap Overspeed Conditional Inspection (CON 33)						
6.17 Landing Gear Overspeed Conditional Inspection (CON 34)						
6.18 Bird Nest Check (CON 1)						

6.19 Operation Over Salt Water Below 3000 Feet (CON 3)	
6.20 Aircraft Exposed to Salt Air Environment (CON 4)	
6.21 External Fuel Tank or Pylon Removal and Installation (CON 7)	
6.22 Retorquing of Fasteners on New Aircraft or After Removal/Installation of Major Flight Surfaces or Structure (CON 8)	
6.23 Cargo Floor and Ram Structure Inspection when Floor or Treadway Limitations are Exceeded (CON 9)	
6.24 Inspection oft eh A/A32H-4A Cargo Handling System Prior to First Airdrop Mission (CON 10)	
6.25 Wedge Pre- and Post-Flight Removal Inspection (CON 11)	
6.26 Engine Attachment and Truss Mount Bold Inspection, Engine Removal and	normally done on next engine removal (put in 336 for aircraft)

Installation (CON 12)
6.27 Cockpit Voice Recorder and Solid-State Flight Data Recorder (CON 14)
6.28 Base Radio Beacon (Tray) (CON 15)
6.29 Flight Data Recorder/Crash Position Indicator Components Removal, Replaced or Disturbed (CON 16)
6.30 Aircraft Stored Without Electrical Power in Excess of 10 Days (CON 17)
6.31 Functional Check of the Defensive Electronic Warfare System Self-Protection Suite Prior to Operational Deployment (CON 18)
6.32 Jettison Mode Operated in the AN/ALE-47 CMDS (CON 21)
6.33 Air-To-Air Refuelling Hose 14-day Flushing and Visual Inspection (CON 32)

Annex D – VACP Components

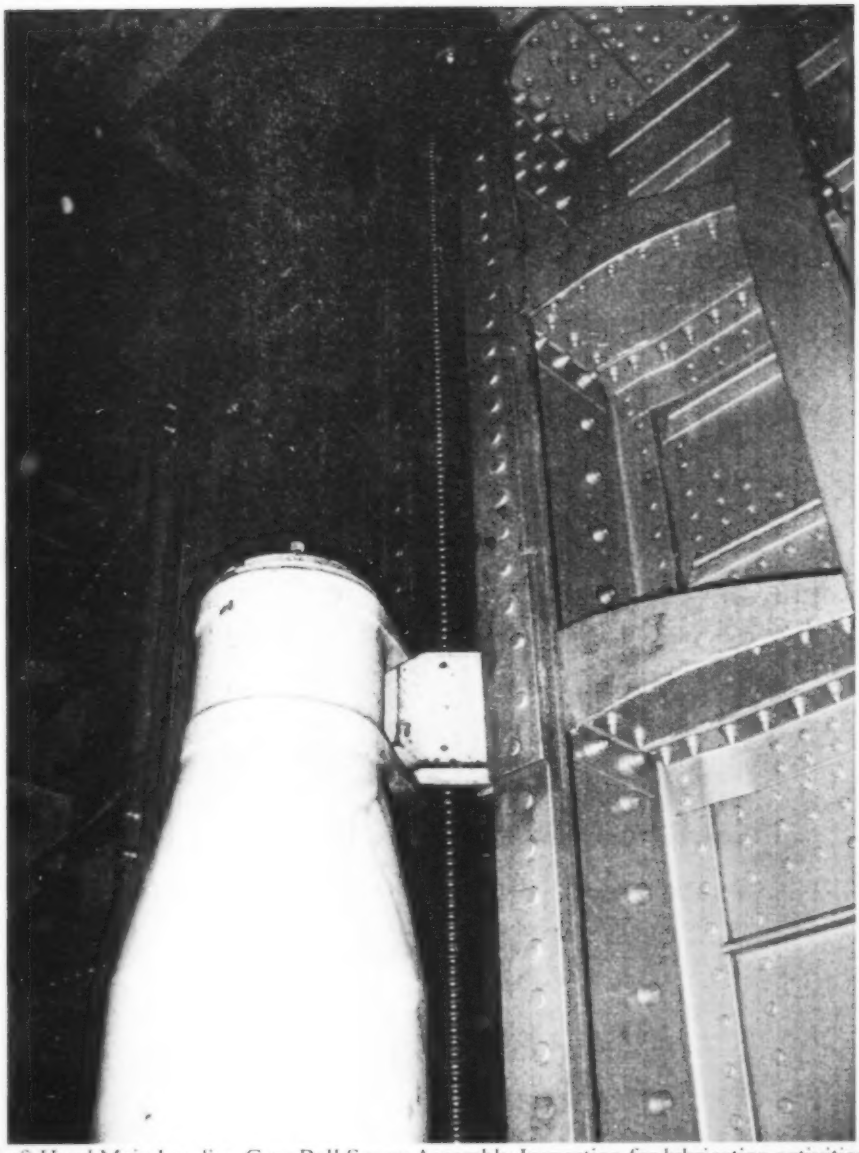
VACP (Visual, Auditory, Cognitive, Psychomotor) data assigns the resource demand imposed on the operators within the ALFCS and FAVS models. Four separate channels account for the demands on human resources, where each task performed by an operator is rated using an interval scale with regard to the weighted task demands within the four channels. Based upon the McCraken and Aldrich workload model, a cumulative rating greater than 7.0 in any one of the four channels implies an operator resource overload.

VACP Channels and W/Index Ratings:

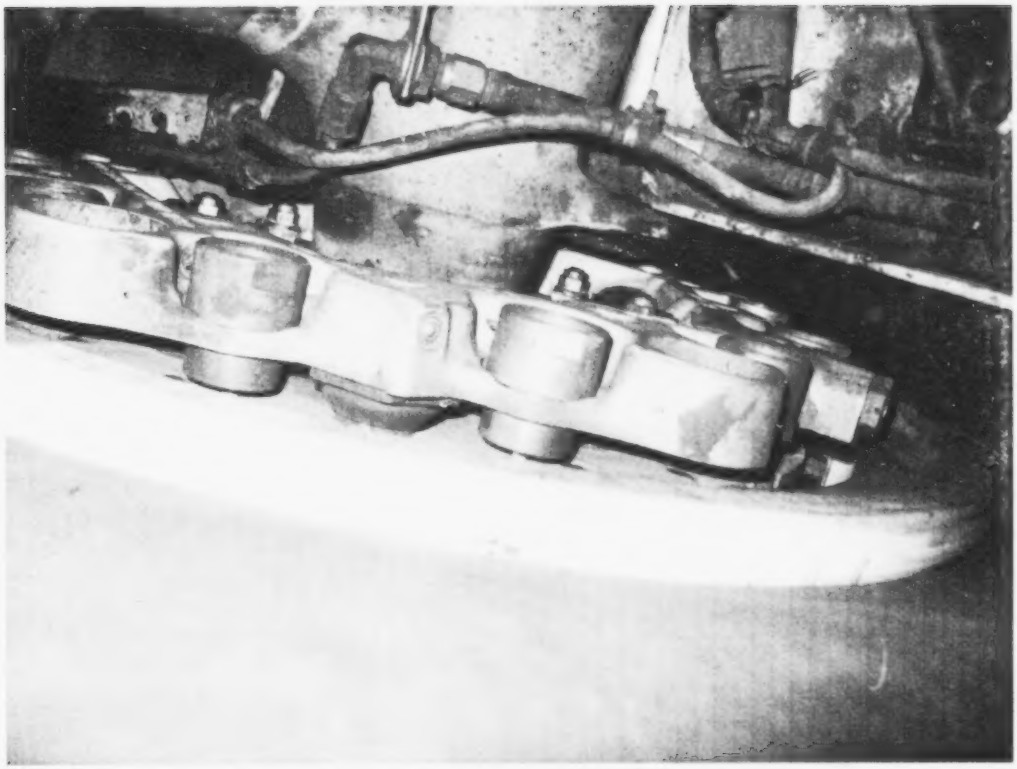
Interval rating (VACP)	**Descriptor**
	Visual – Unaided (naked eye)
1	Register/Detect (Detect Occurrence of Image)
3.7	Discriminate (Detect Visual Difference)
4	Inspect/Check (Discrete Inspection/Static Condition)
5	Locate/Align (Selective Orientation)
5.1	Track/Follow (Maintain Orientation)
5.9	Read (Symbol)
7	Scan/Search/Monitor (Continuous /Serial Inspection, Multiple Conditions)
	Auditory
1	Detect/Register Sound (Detect Occurrence of Sound)
2	Orient to Sound (General Orientation/Attention)
4.2	Orient to Sound (Selective Orientation/Attention)
4.3	Verify Auditory Feedback (Detect Occurrence of Anticipated Sound)
4.9	Interpret Semantic Content (Speech)
6.6	Discriminate Sound Characteristics (Detect Auditory Differences)
7.0	Interpret Sound Patterns (Pulse Rates, etc.)
	Cognitive
1	Automatic (Simple Association)
1.2	Alternative Selection
3.7	Sign/Signal Recognition
4.6	Evaluation/Judgement (Consider Single Aspect)
5.3	Encoding/Decoding, Recall
6.8	Evaluation/Judgement (Consider Several Aspects)
7.0	Estimation, Calculation, Conversion
	Psychomotor
1.0	Speech
2.3	Discrete Actuation (Button, toggle, trigger)
3.6	Continuous Adjustive (Flight Control, Sensor Control)
4.6	Manipulative
5.8	Discrete Adjustive (Rotary , Vertical Thumbwheel, Lever Position)
6.5	Symbolic Production (Writing)
7	Serial Discrete Manipulation (Keyboard Entries)

Annex E - Photo-Documentation

AVNs opening left landing-gear compartment to prepare for visual inspection.

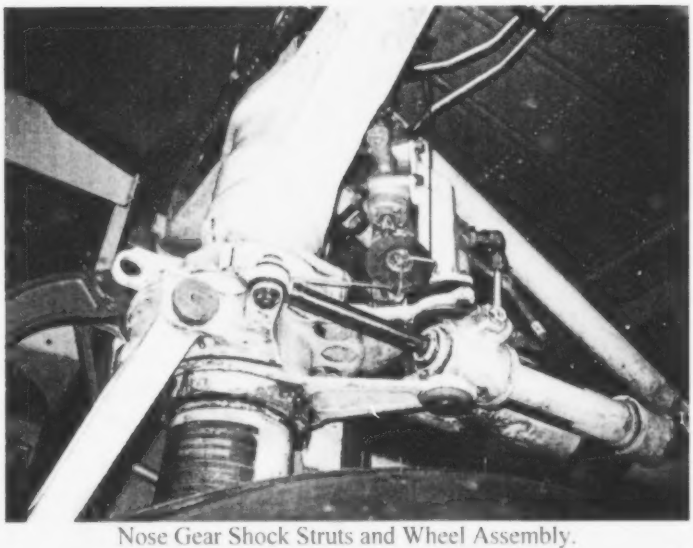


Left Hand Main Landing Gear Ball Screw Assembly Inspection for lubrication activities.

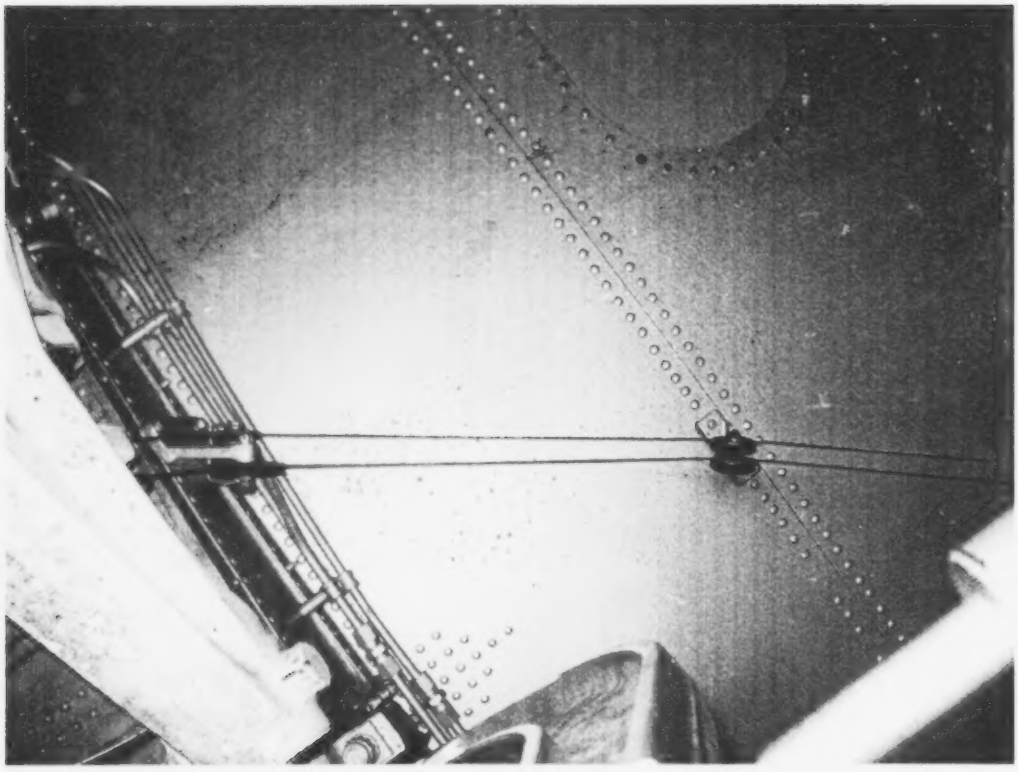


Left Hand Main Landing Gear Wheel Brake Unit Inspection.

Landing Gear Wheel Well and Witness Wires.

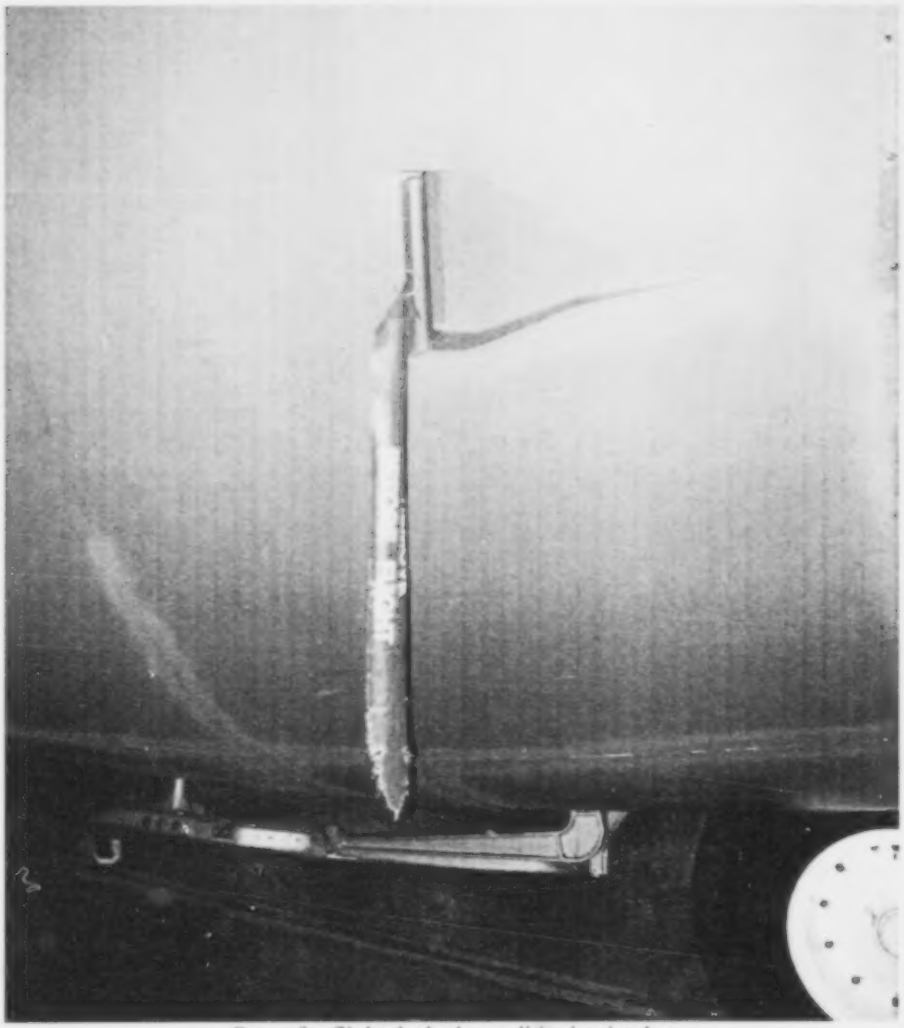


Nose Gear Shock Struts and Wheel Assembly.

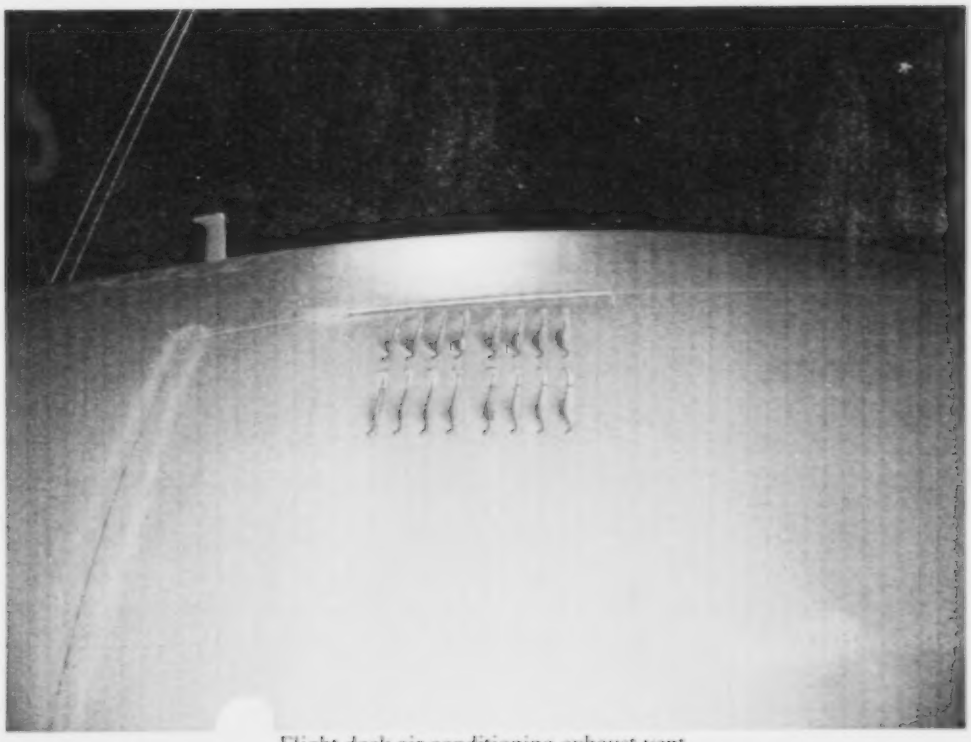


Flight Control System Inspection Under Nose Wheel Well.

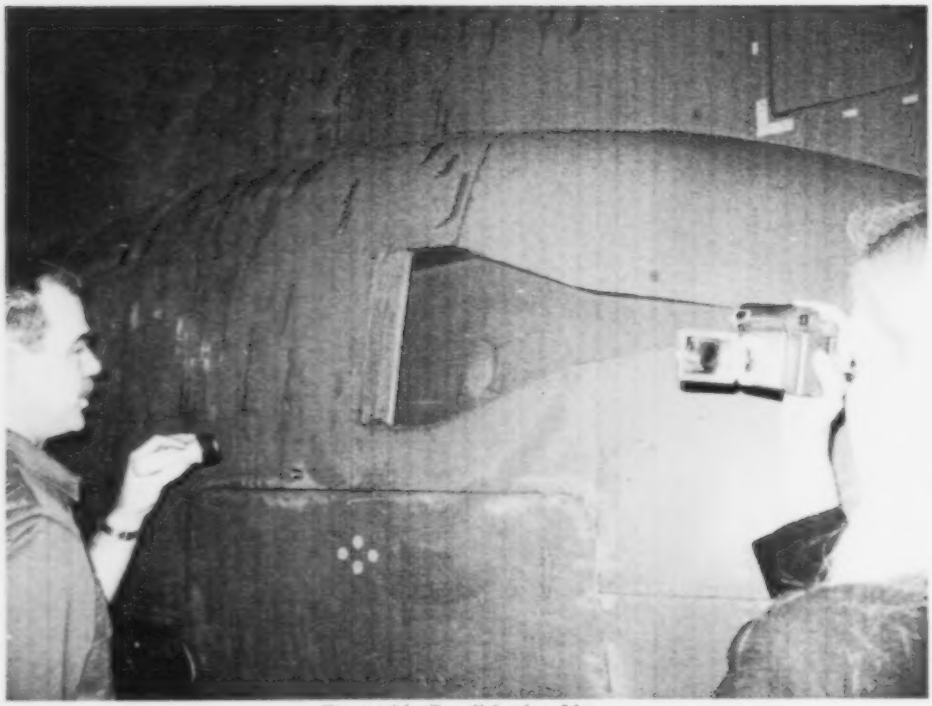
Liquid Oxygen Servicing Point. Converter is on inside, gauge is in cockpit.



Cover for flight deck air conditioning intake.

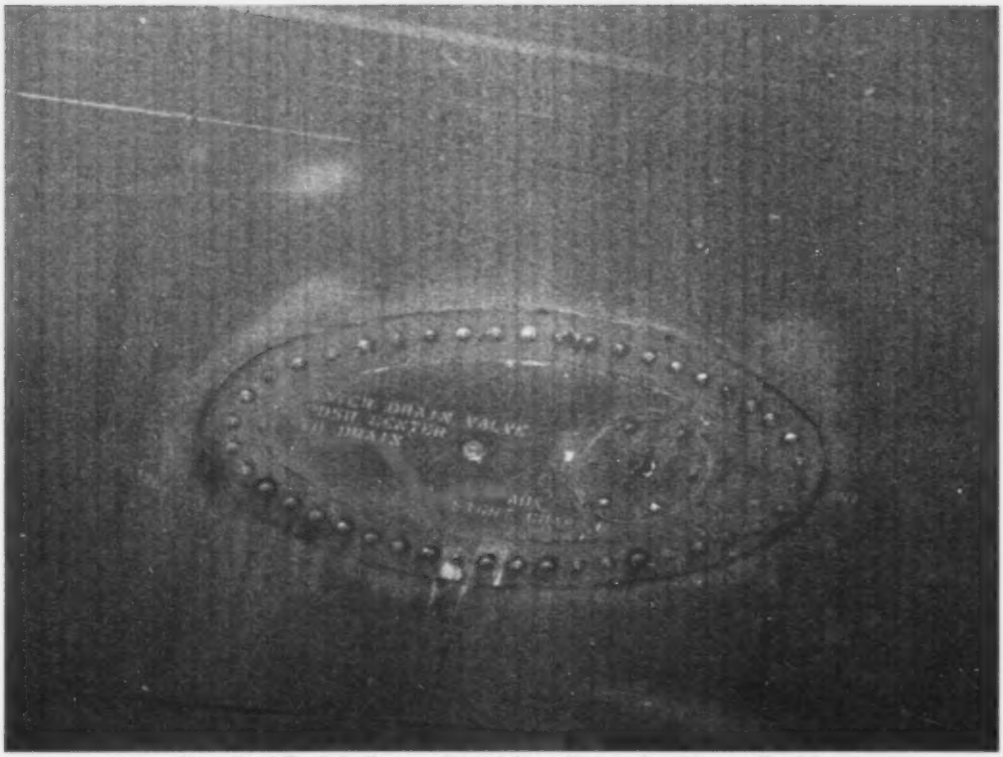


Flight deck air conditioning exhaust vent.

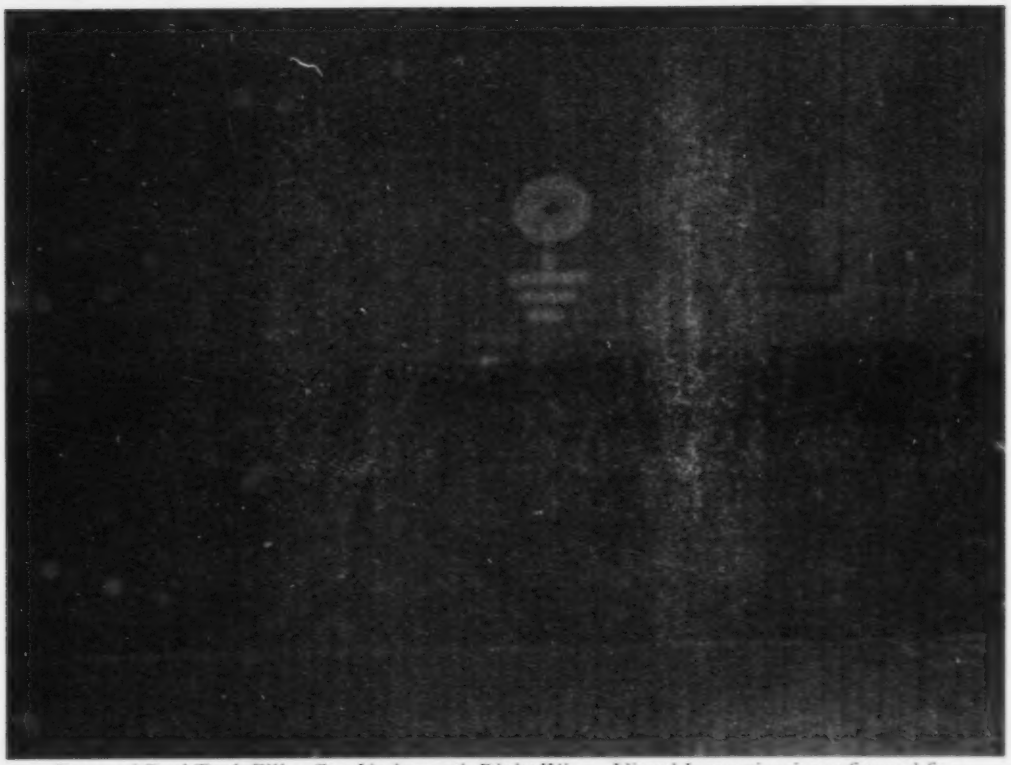


Cargo Air Conditioning Vent.

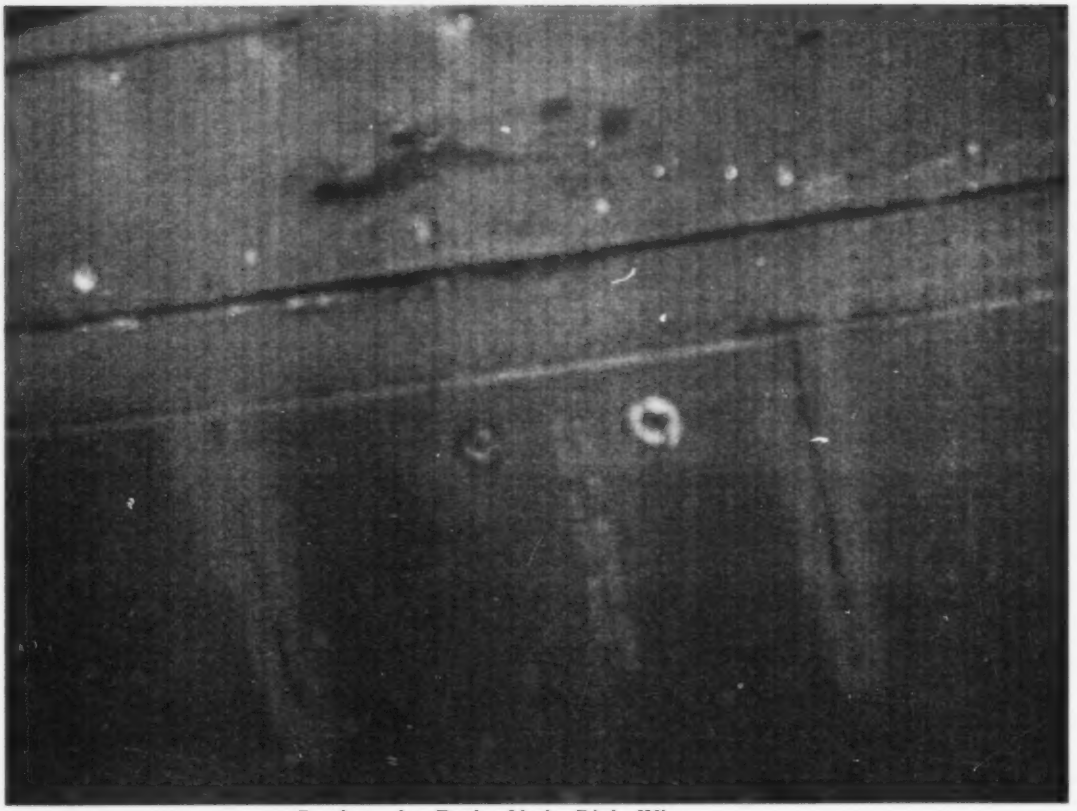
Cargo Air Conditioning Exhaust and Servicing Panel.



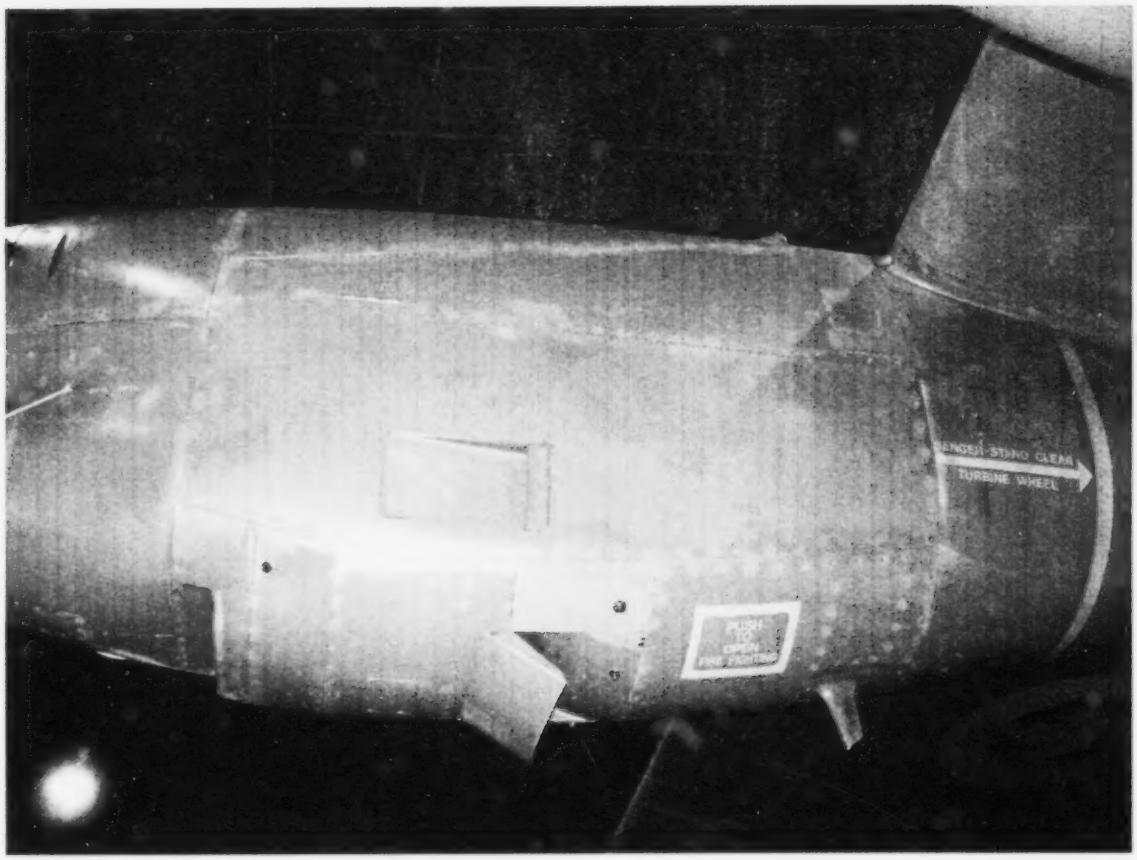
Auxiliary Fuel Tank Indicator (Dipstick) to Determine Current Fuel Load



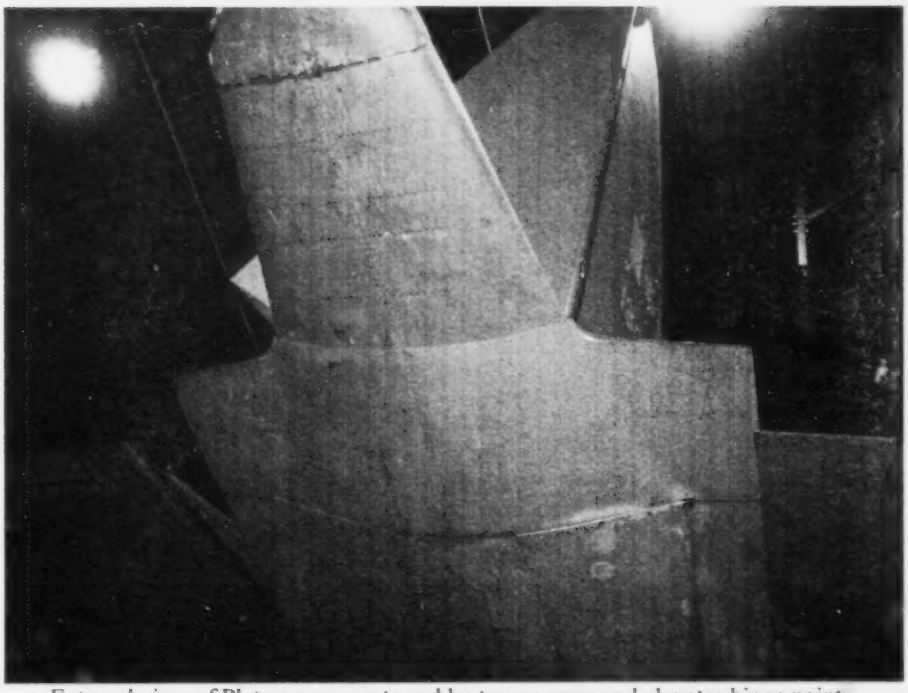
. External Fuel Tank Filler Cap Underneath Right Wing. Visual Inspection is performed for contents of tank. These indicators are for ops restricted tanks.



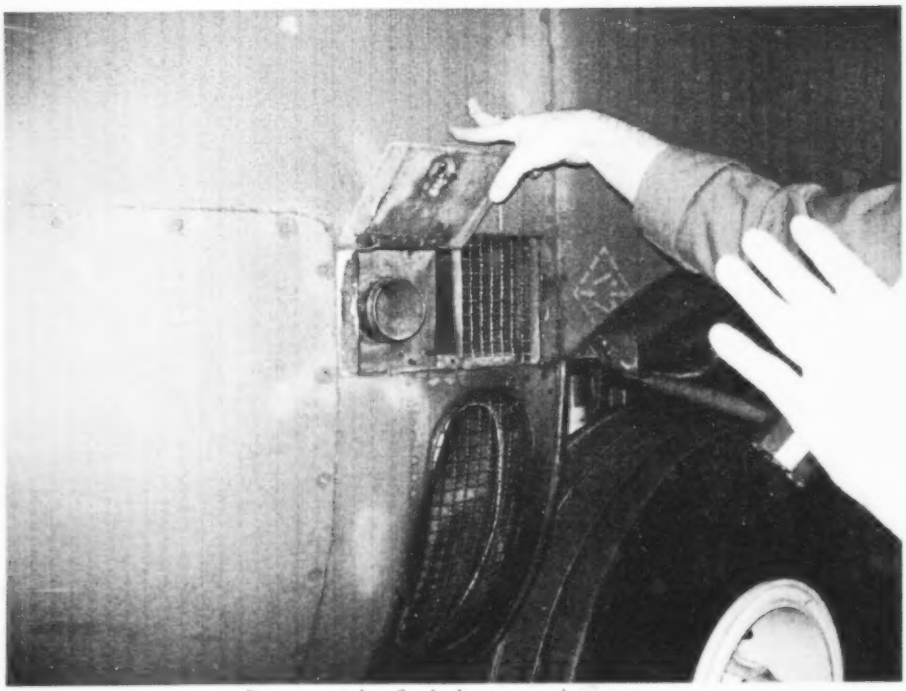
Condensation Drains Under Right Wing.



Hatches for Engine Compartment Access.

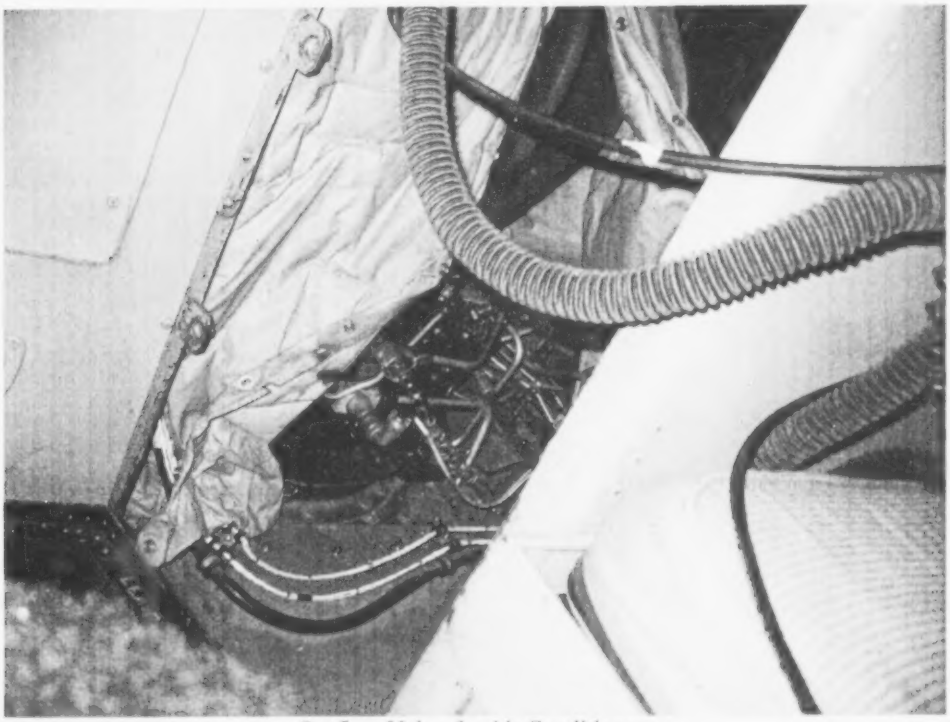


External view of Platypus access to rudder torque arms and elevator hinge points.



Pressure valve for in-hangar maintenance.

Typical interior armour plating. These must be removed from aircraft surfaces prior to inspection.



Outflow Valve for Air Conditioner.

Glossary

ACGIH	American Conference of Governmental Industrial Hygienists
CCOHS	Canadian Centre for Occupational Health and Safety
CFB	Canadian Forces Base
FE	Flight Engineer
IPME	Integrated Performance Modelling Environment
MAMS	Mobile Air Movement Section
MFTA	Mission, Function, Task Analysis
MOS	Military Occupational Structure
MRS	Maintenance Record Set
SME	Subject Matter Expert
SOP	Standard Operating Procedure
VACP	Visual, Auditory, Cognitive and Psychomotor
WBGT	Wet Bulb Globe Temperature

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(U) This report documents the conduct and associated results of a Mission, Function, Task Analysis (MFTA) for the CC130 Hercules aircraft technician. The MFTA was conducted in order to assess operator performance in extreme environmental conditions, and specifically focused on the impact of high temperature environments on error rates. To categorize maintenance technician tasks, a literature review of existing maintenance documentation was performed. Additional research was conducted to assess the existing occupational, safety and health guidelines for operations in high temperature environments. A function and task analysis was then conducted with CC130 Subject Matter Experts to populate a task database with timing and workload data. The results of the MFTA indicate that while no formal procedures exist for operations within extreme climactic conditions, the maintenance community has developed a set of informal guidelines to minimize the impact of thermal strain on operator error. Additional effort should also be conducted to determine the impact of NBCD conditions on operator performance by integrated the task data from the current analysis within human performance modelling techniques.

(U) Le présent rapport fait état de la conduite d une analyse de la mission, du rôle et des tâches (AMRT) du technicien en aéronautique de l avion CC130 Hercules ainsi que des résultats qui y sont associés. L AMRT a été effectuée pour permettre d évaluer le rendement du technicien dans des conditions environnementales extrêmes et elle a porté spécifiquement sur les effets de milieux à haute température sur le nombre d erreurs commises. En vue de catégoriser les tâches des préposés à la maintenance, on a passé en revue la documentation existante relative à la maintenance. D autres recherches ont été menées afin de permettre d évaluer les lignes directrices en vigueur relativement au métier ainsi qu à la santé et à la sécurité dans le cas d opérations menées dans des milieux où la température est élevée. Une analyse du rôle et des tâches a alors été menée de concert avec des experts du CC130 afin d alimenter une base de données de tâches au moyen de données sur les échéanciers et les charges de travail. Les résultats de l AMRT indiquent que bien qu il n y ait pas de procédures formelles dans le cas des opérations dans des conditions climatiques extrêmes, le milieu de la maintenance a élaboré un ensemble de lignes directrices officieuses pour réduire au minimum l effet du stress thermique sur les erreurs commises par les techniciens. D autres efforts devraient être consacrés à la détermination des effets des conditions de DNBC sur le rendement du technicien grâce à l intégration des données sur les tâches obtenues de l analyse actuelle aux techniques de modélisation des performances humaines.

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(U) CC130; Hercules; aviation technician; heat strain